The RUBBER AGE

August, 1942

TECHNOLOGY DEPT.

TYSONITE

TYSONITE is an organic rubber-like plastic with a specific gravity of 1.04. It is resistant to water, ozone and many chemicals.

TYSONITE is supplied both in dry solid form and as a water dispersion of 60-62 per cent solids.

TYSONITE can be used in many products to replace rubber in part or entirely.

• • • In your efforts to produce rubber-like goods with less rubber or without rubber you can well afford to work with **TYSONITE**

R. T. VANDERBILT CO., INC.
230 Park Avenue, New York City

Newsletter No. 8 *PUBLISHED BY RUBBER CHEMICALS DIVISION OF* DU PONT *AUGUST, 1942*

Neoprene Latex Users Urged to Evaluate New Type 571

TO meet the greatly expanding demand for neoprene latex a new and improved manufacturing process has been developed which will enable us to increase its production considerably in existing equipment.

This new product which has been named Neoprene Latex Type 571 is similar to Neoprene Latex Type 57, and the latex chemist will find it an easy matter to adapt Neoprene Latex Type 571 on a production scale. To the user of neoprene latex, the development of Type 571 means two things:

1. Larger quantities of neoprene latex will be available.
2. The latex chemist and production man will have to make only slight adjustments in compounding and production technique from those employed with previously-used types of neoprene latex.

NEOPRENE LATEX TYPE 571 is a general-purpose latex. Like Type 57, it contains approximately 50% solids by weight and the two have approximately the same viscosity. The stability of Type 571 is of the same order as Type 57 in either the uncompounded or compounded forms. Articles may be made wholly or in part from this new latex by the usual processes of dipping, impregnation, spreading, spraying or molding by gelation. Cured films and coatings from properly compounded mixes of Neoprene Latex Type 571 exhibit practically the same tensile strength, hardness, permanent set and resistance to tear, to oils and water, and to aging as do vulcanizates of Neoprene Latex Type 57 compositions.

DIFFERENCES BETWEEN TYPE 571 AND TYPE 57—Neoprene Latex Type 571 differs slightly from Type 57 in color, odor, wetting properties and behavior on addition of the accelerators, Tepidone and Tetrone A. Slight modifications in compounding are required to give the best coagulating dip films.

COMPOUNDING—The basic formula recommended for use with Neoprene Latex Type 571 is the same as that currently recommended for use with Type 57. Using the basic formula as a starting point, special compositions may be readily developed to meet varying service conditions by the addition of the proper modifying agents, fillers and softeners.

Typical physical data on porous cup films made from standard compositions of Neoprene Latex Type 571 and Type 57 are compared in Table I below:

TABLE 1

Comparison of Stress-Strain Properties of Neoprene Latex Type 571 and Type 57

Air Cure Minutes	Stress in psi at elongation of			Tensile Strength at break	Elongation at break
at 140°C.	300%	600%	800%	psi	%
Films from Type 571					
15	125	1225	1475	3425	900
30	125	1250	1600	4125	940
60	150	1250	2200	4075	940
Films from Type 57					
15	150	675	1850	4025	1000
30	175	825	2400	4325	920
60	175	1025	3175	4425	870

AVAILABILITY—Neoprene Latex Type 571 will be produced in larger qunatities than other types previously manufactured, and will be supplied on order against allocations authorized by the War Production Board.

Manufacturers of products from neoprene latex are urged to evaluate Type 571. Samples and technical literature covering the compounding and processing of Neoprene Latex Type 571 are available to rubber manufacturers upon request. Ask for our informal Report BL-44 entitled "Neoprene Latex Type 571," on your company letterhead.

Through the Mill

MBT AND MBTS *are now available for immediate delivery from our plant at Carney's Point, New Jersey, or from our warehouses located at the following points:*

E. I. du Pont de Nemours & Co., (Inc.)
51 Sleeper Street
Boston, Massachusetts

E. I. du Pont de Nemours & Co., (Inc.)
% Cotter City View Storage Co.
1031 Sweitzer Avenue
Akron, Ohio

E. I. du Pont de Nemours & Co., (Inc.)
% Midland Warehouse & Transfer Co.
1521 South Western Avenue
Chicago, Illinois

E. I. du Pont de Nemours & Co., (Inc.)
5801 South Broadway
Los Angeles, California

E. I. du Pont de Nemours & Co., (Inc.)
235 Second Street
San Francisco, California

E. I. du Pont de Nemours & Co., (Inc.)
% Anchor Warehouse
New York and Olden Avenues
Trenton, New Jersey

BUGS! *Fungi germinate on rubber products under certain favorable conditions of temperature and humidity. During germination, the fungi generate harmful organic chemicals which cause premature deterioration of the rubber. A recent investigation indicates that Thionex is an effective fungicide in rubber, its effectiveness being proportional to the amount used. Details of this interesting series of tests will be gladly supplied to rubber manufacturers upon request. Neoprene and butadiene-acrylonitrile type synthetic were included in the series of compounds tested. Neoprene inherently resists fungus growth, probably because the presence of the chlorine radical, and therefore requires no additional fungicide. The butadiene-acrylonitrile synthetic seems to be similar to natural rubber in lack of resistance to fungi.*

RUBBER CHEMICALS DIVISION

Wilmington DU PONT *Delaware*

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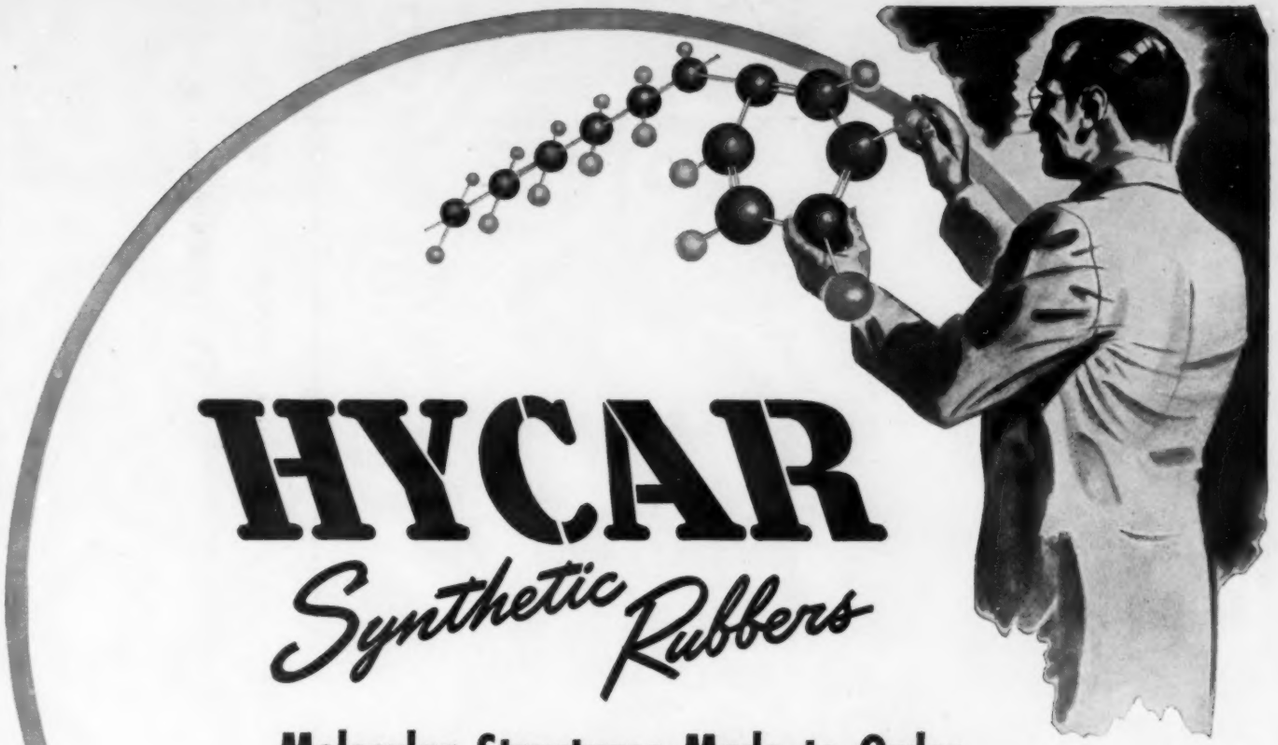


HYCAR
Synthetic Rubbers

Molecular Structures Made to Order

Don't let that technical phrase "molecular structures" fool you. In Hycar synthetic rubber it means simply changing chemical formulas so that certain desired physical properties are put into different types of Hycar.

For example, Hycar in a tire or tank track is a special type of synthetic rubber to withstand abrasion, flexing, sunlight, and heat. The Hycar in a hose or tube must be impervious to the oil or the acid that passes through it. Hycar linings for aircraft fuel tanks must be resistant to gasoline. Extreme heat and cold, high pressures, terrific strain, electrical conductivity—these are some of the problems that must be licked in the ton of rubber products that go into the building of a military plane, with one common factor always paramount—light weight.

To control the physical properties of Hycar in different industrial services, Hycar chemists have conducted thousands of experiments. Thousands of tons of Hycar synthetic rubber are being produced. Countless articles are being made of Hycar—each using a type of Hycar synthetic rubber which has been literally tailor-made for the specific purpose.

Hycar is a raw material furnished to manufacturers of finished rubber products. Ask your supplier for information. If you are making a war essential, Hycar chemists and technicians will be glad to cooperate to speed production and to determine the type of Hycar for your needs.

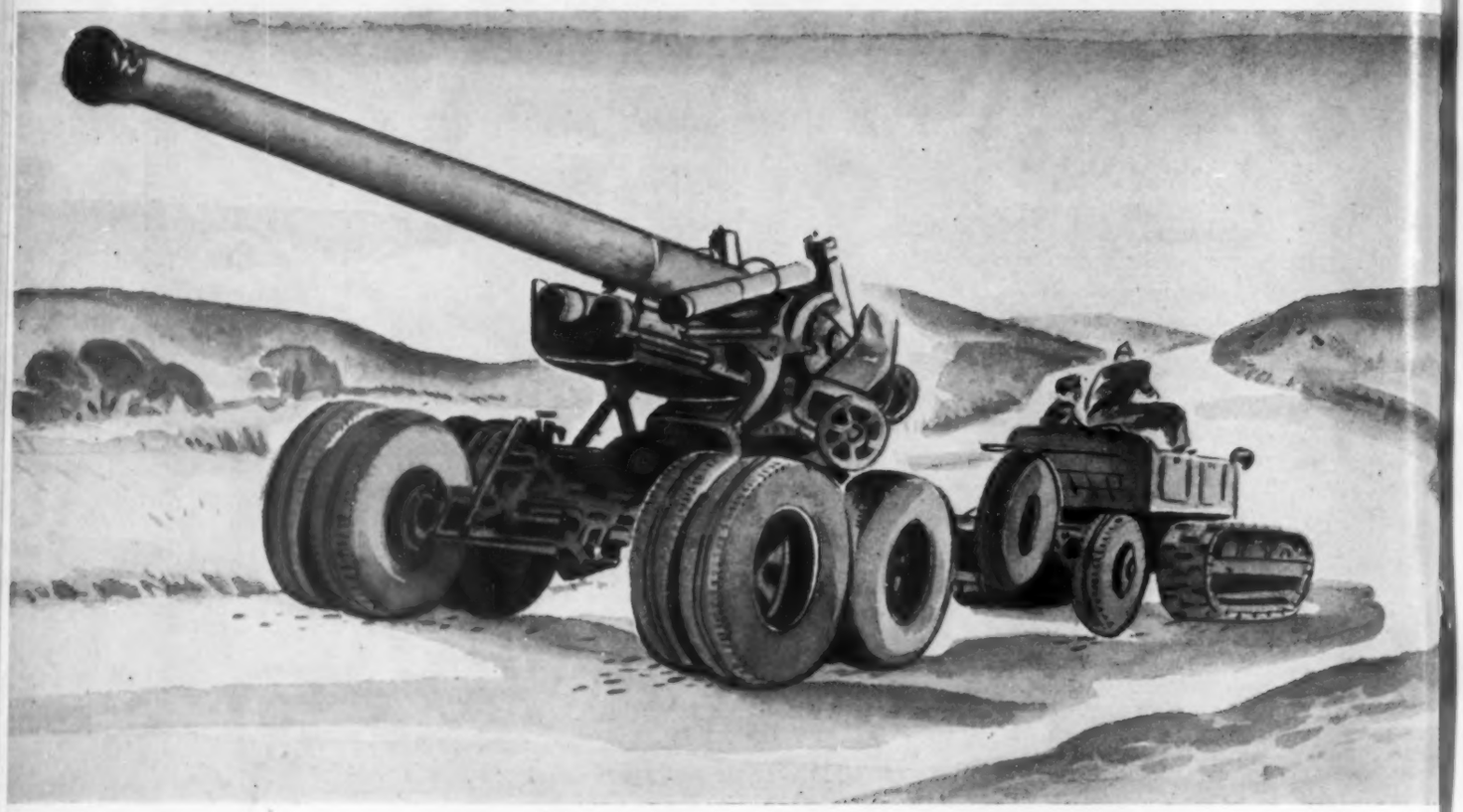
HYCAR CHEMICAL COMPANY, *Akron, Ohio*

RESEARCH • ENGINEERING • PRODUCTION

HYCAR *Synthetic* Rubber

LARGEST INDEPENDENT PRODUCER IN AMERICA OF BUTADIENE SYNTHETIC RUBBER

OUR ARMED FORCES ROLL ON RUBBER



KEEP YOUR PRODUCTION *Rolling*

with **CLIMCO PROCESSED LINERS**

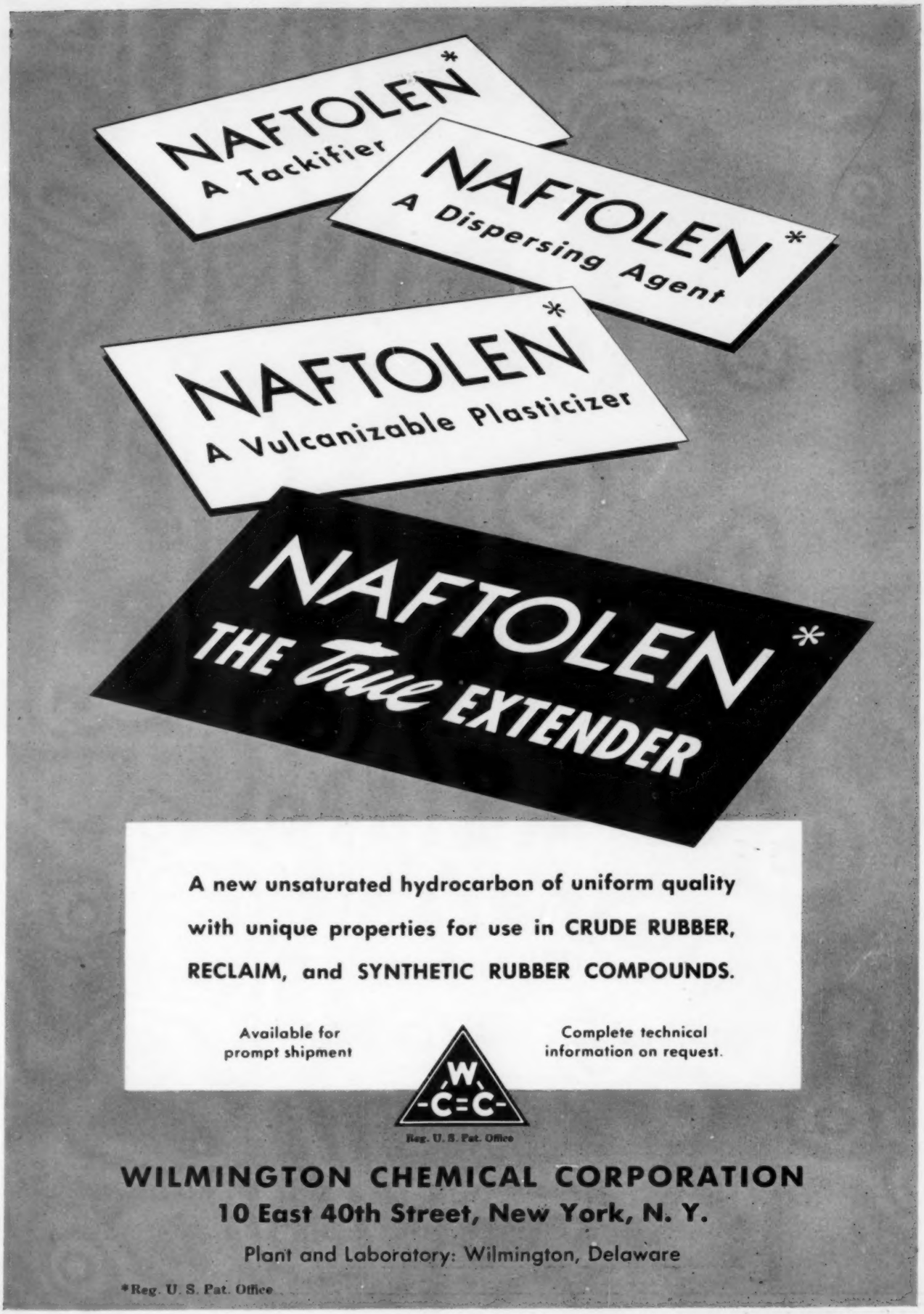
★ With Climco Processed Liners on the job, production at the cutting table flows smoothly and without interruption. Climco Processing prevents stock adhesions. This means no time is wasted in repairing cut or torn liners, or in rerolling for cooling. Climco Processing also saves the time consumed in brushing and cleaning the liners. It eliminates lint and ravellings. ★ By solving these problems, Climco Processing not only speeds production, it also causes a corresponding reduction in labor and power costs. ★ For years many companies have gained these benefits by having their liners Climco Processed. Now that production schedules are tougher than ever before, you should give Climco Processing a trial in your plant.

CLIMCO

LINERETTE
INTERLEAVING PAPER
Treatment Contains
NO OIL OR WAX
Samples on Request

THE CLEVELAND LINER & MFG. CO.
Cleveland, Ohio

CLIMCO PROCESSED LINERS
For Faster, Better Production at Lower Cost


NAFTOLEN*
A Tackifier
NAFTOLEN*
A Dispersing Agent
NAFTOLEN*
A Vulcanizable Plasticizer
NAFTOLEN*
THE True EXTENDER
A new unsaturated hydrocarbon of uniform quality with unique properties for use in CRUDE RUBBER, RECLAIM, and SYNTHETIC RUBBER COMPOUNDS.
Available for prompt shipment
Complete technical information on request.
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Plant and Laboratory: Wilmington, Delaware
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Tensile strength

Resistance to aging

Dielectric strength

Write Our Technical Service Dept. for Details.

MOORE & MUNGER

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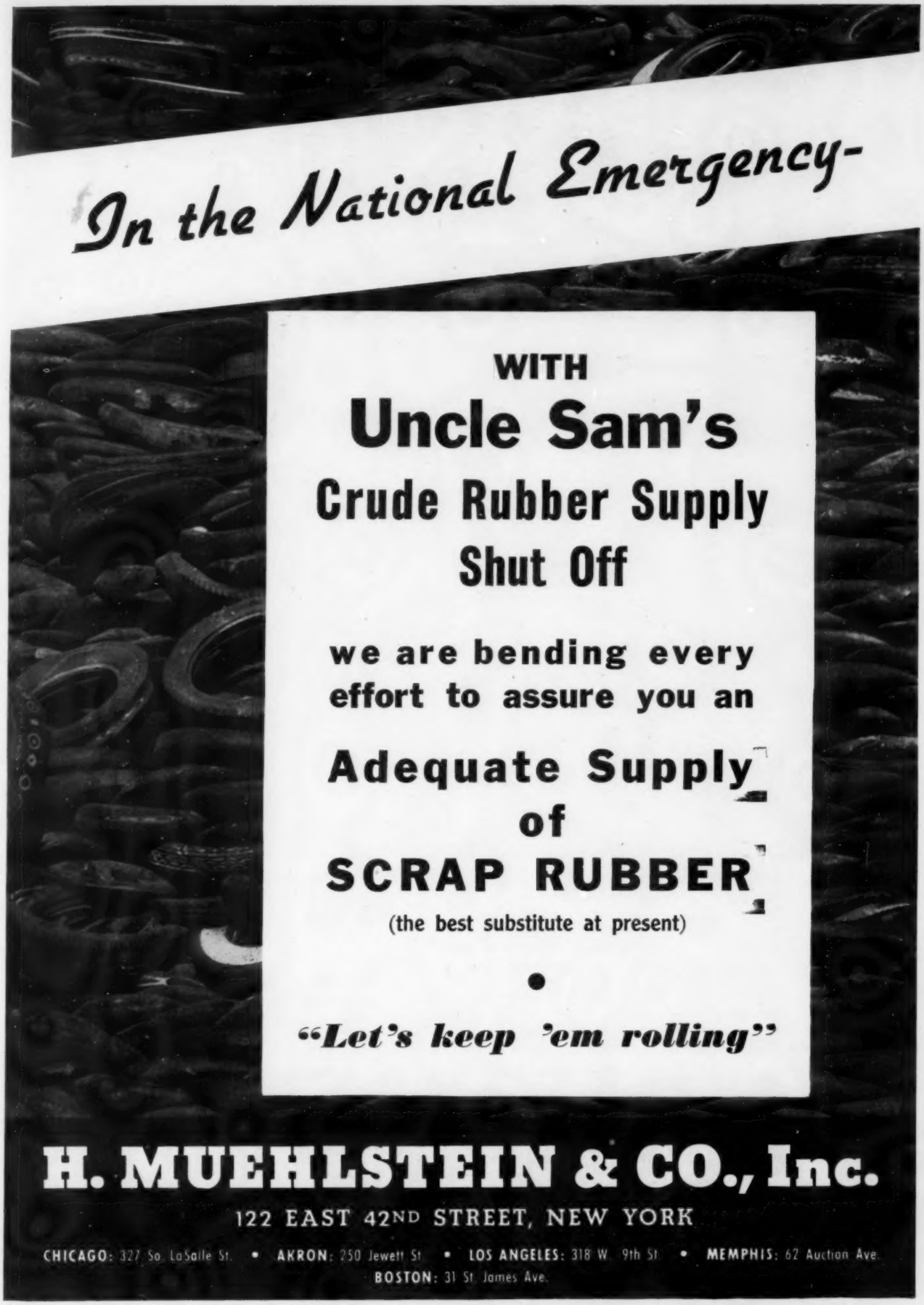
In the National Emergency-
WITH
Uncle Sam's
Crude Rubber Supply
Shut Off
we are bending every
effort to assure you an
Adequate Supply
of
SCRAP RUBBER
(the best substitute at present)
"Let's keep 'em rolling"
H. MUEHLSTEIN & CO., Inc.
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CHICAGO: 327 So. LaSalle St. • AKRON: 250 Jewett St. • LOS ANGELES: 318 W. 9th St. • MEMPHIS: 62 Auction Ave.
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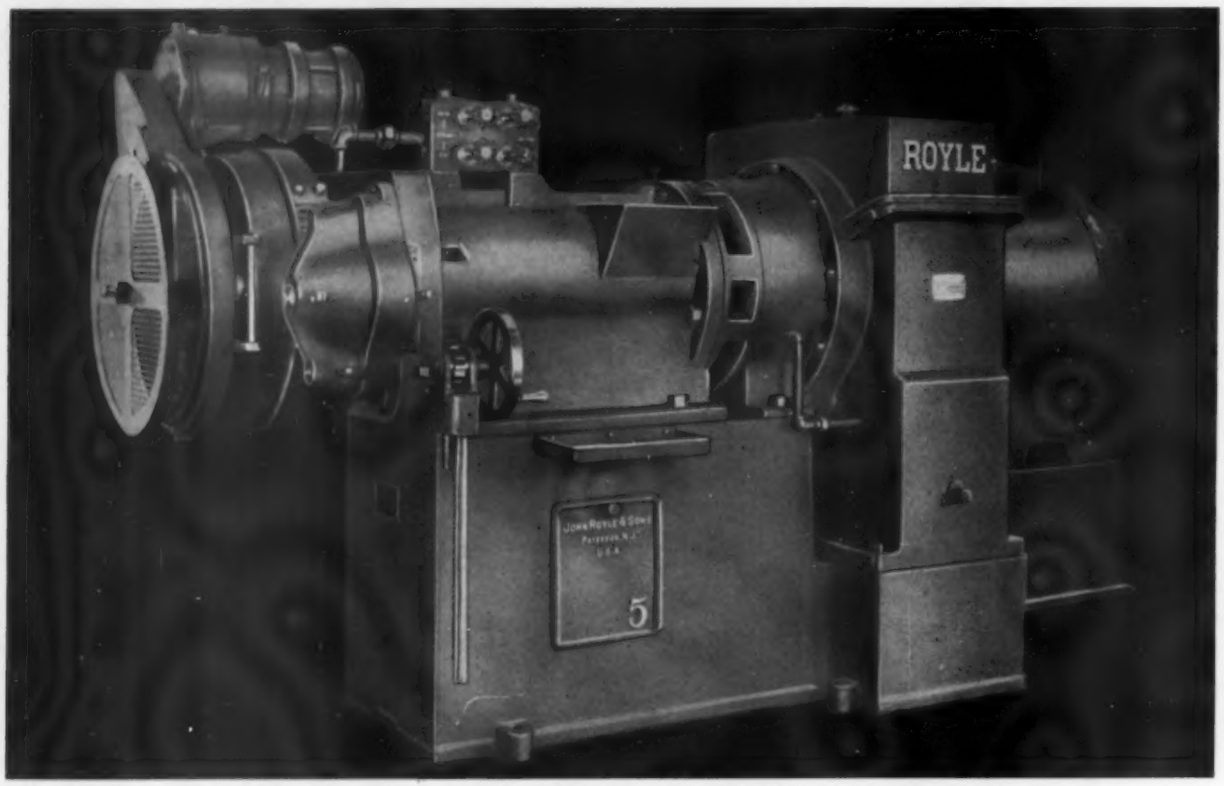

A PRODUCING STRAINER! THE ROYLE 8½" WITH MANUALLY-OPERATED BREECH LOCK HEAD

In factories throughout the country, chimneys belch black smoke and giant machines roar as raw materials are converted into goods that make America strong.

★ — **BUSINESS IS GOOD** because industry is bustling to produce the goods and machines required to build guns, planes and ships, vital to national defense.

John Royle & Sons is typical of America today as she strains to meet the quickening demand. Our business is good because of the increasing demand for the kind of quality and service we give. To the limit of our facilities, top service is always at your call.

John Royle & Sons *Since 1855*

ROYLE
PATERSON
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AKRON, J. C. CLINEFELTER • • LONDON, JAMES DAY (MACHINERY) LTD.

ROYLE'S 62ND. YEAR OF EXTRUDING MACHINE MANUFACTURE

WAR PRODUCTION OF SYNTHETIC RUBBER *DEMANDS*

PRECISION

-in processes
-in materials

You can depend *absolutely* on the uniform quality of all PICCO Chemicals, including the following, specially prepared for the rubber industry.

Di POLYMER OIL for plasticizing synthetic rubber of the co-polymer butadiene types.

TYPE C RECLAIMING OIL for reclaiming synthetic rubbers.

PICCOUMARON XX SERIES RESINS (para-coumarone-indene) for extending and compounding natural and synthetic rubber.

PICCOUMARON RESINS for hardening, leatherizing or softening mechanical rubber goods.

PICCO RECLAIMING OILS (D-4, E-5, C-10) for reclaiming rubber by autoclave or pan methods.

PICCOLYTE RESINS—similar chemical analysis (carbon-hydrogen ratio) to rubber; for extending, tackifying and cementing.

PENNSYLVANIA
INDUSTRIAL CHEMICAL CORPORATION
CLAIRTON, PENNA.

Representatives in Principal Cities

Makers of: Coumarone Resins • Coal Tar Naphthas • Rubber Plasticizers • Reclaiming Oils

Here's one way to conserve rubber!

Add more Zinc Oxide to ALL-RECLAIM compounds

The chart below shows the effect of increasing the zinc oxide content of a compound from 3 to 35 parts. Tests were carried out with *Horse Head XX Red 4 Zinc Oxide.*

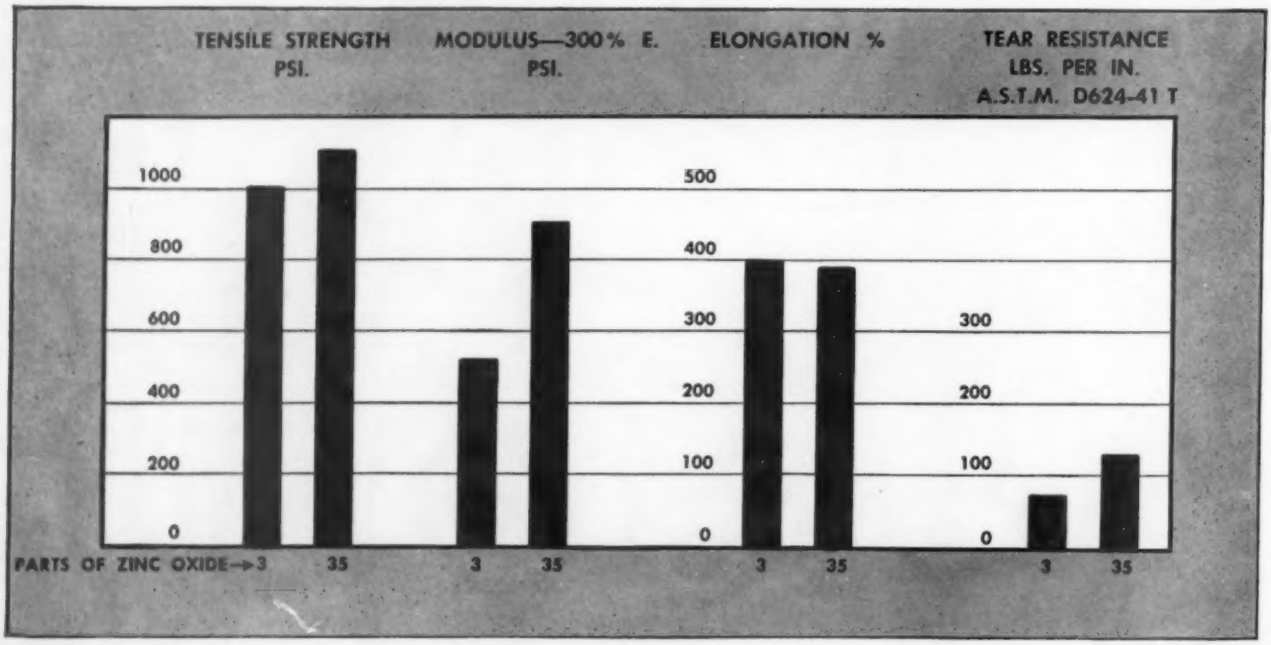
The Compound . . . . . .

WHOLE-TIRE RECLAIM	60.
SULFUR	1.
"CAPTAX"	0.0625
AGE-RITE POWDER	0.0625
ZINC OXIDE	AS NOTED

Cure—60 Min. at 40 lbs. Steam (287°F)

The Results . . .

Higher Physical Properties
Improved Processing



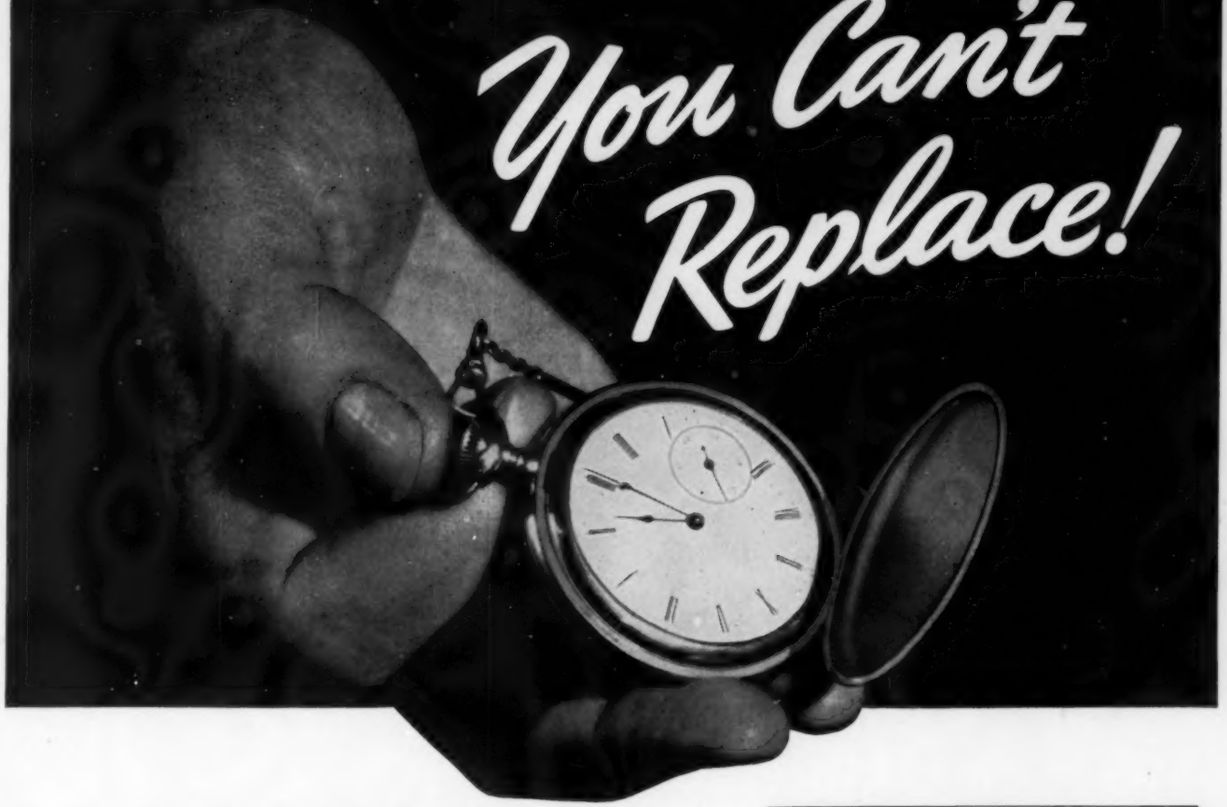
New Jersey zinc

THE NEW JERSEY ZINC COMPANY • 160 FRONT STREET, NEW YORK

UNIFORM QUALITY ZINC OXIDES - - THE HORSE HEAD BRANDS

TIME IS ONE THING

You Can't Replace!



...SKELLYSOLVE SERVICE *Prevents Its Loss!*

● When time makes a difference—it makes a *whale of a difference.*

That is exactly why so many users of solvents depend on *Skellysolve*—and on *Skellysolve Service.* When an emergency arises—Skellysolve Service meets it. When you must have the right type of solvent and must have it f-a-s-t—Skellysolve Service *gets it there.* When you have a problem that requires specialized technical knowledge—Skellysolve Service tackles it with sleeves rolled up.

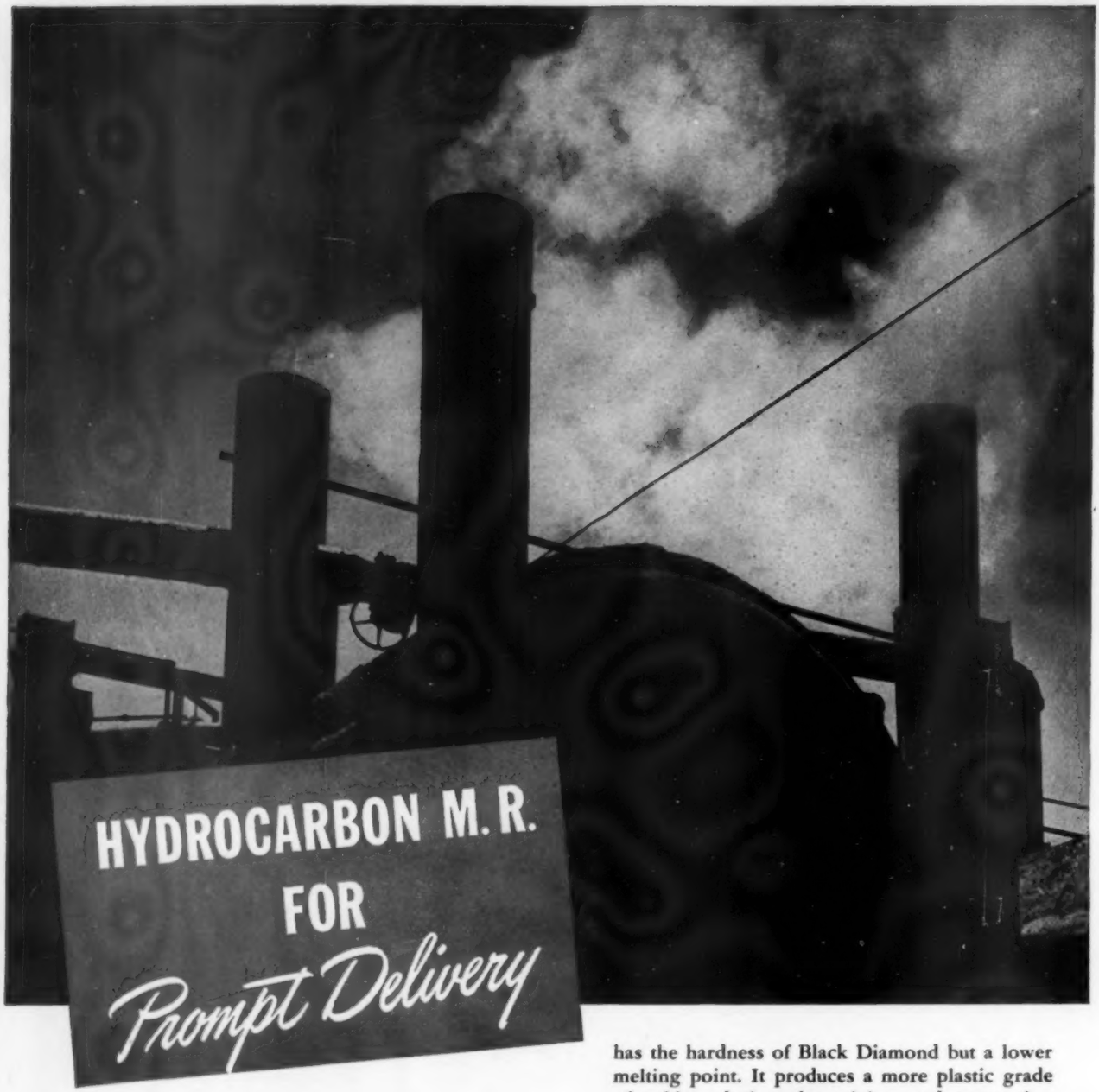
You, too, can depend on Skelly. Phone, write, or wire for information or assistance. Address SKELLYSOLVE DIVISION at address below.

SKELLYSOLVE
in the
RUBBER INDUSTRY

There are six different types of Skellysolve which are especially adapted to various uses in the rubber industry, for making rubber cements, and for many different rubber fabricating operations. Skellysolve offers many advantages over benzol, rubber solvent gasoline, toluol, carbon tetrachloride, etc. It will pay you to investigate Skellysolve. Write today.

SKELLYSOLVE

SOLVENTS DIVISION, SKELLY OIL CO.
SKELLY BLDG., KANSAS CITY, MO.



If you are having trouble obtaining Hydrocarbon M. R. for use in your rubber products, let Wishnick-Tumpeer, Inc., meet your needs.

Our two modern, strategically located plants are producing at full capacity to meet vital war demands, but we have the extra facilities to fill your orders also.

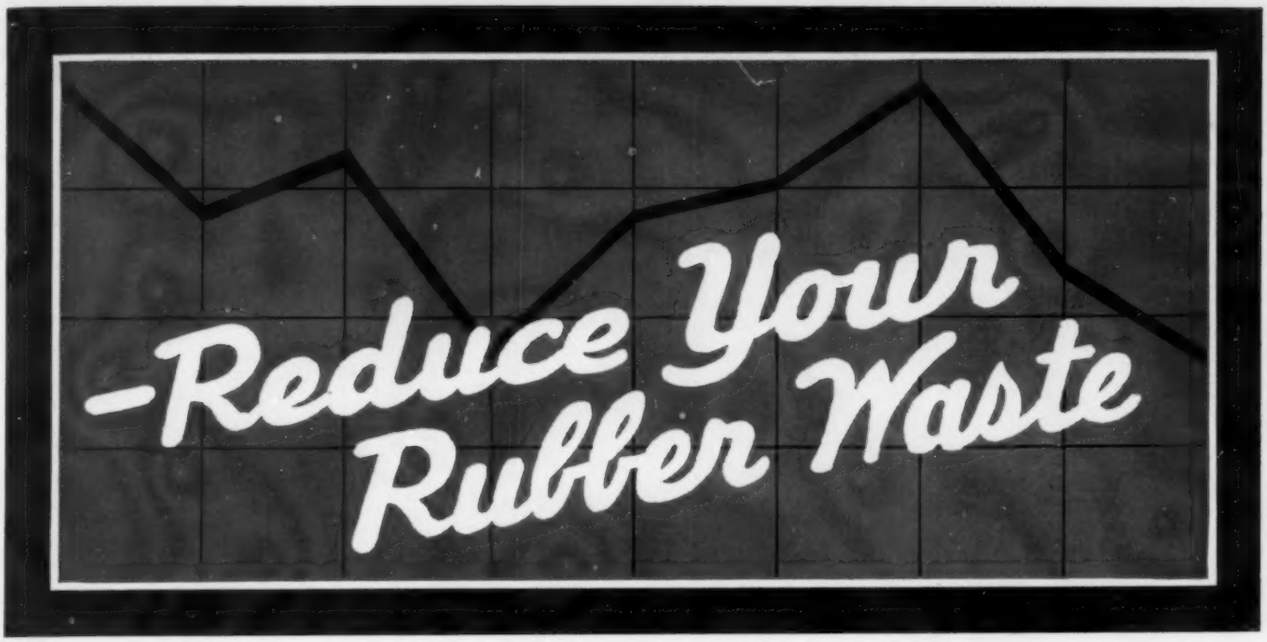
Two standard grades of Witco Hydrocarbon M. R., which cover a broad range of applications, are available for immediate delivery. One is Black Diamond, for highly loaded compounds. The other is No. 38, which has the hardness of Black Diamond but a lower melting point. It produces a more plastic grade of rubber during the mixing and processing operations. Both grades are offered in granular and solid forms. In addition to these we have other grades available and can develop new grades to meet your specific requirements.

Witco Hydrocarbons are produced by the most modern methods from carefully selected and tested materials. In addition to the cooperation of our experienced service staff, we offer you the facilities of our research and product development laboratory. Write, phone or wire today.

WISHNICK-TUMPEER, INC.

MANUFACTURERS AND EXPORTERS

New York, 295 Madison Ave. • Boston, 141 Milk St. • Chicago, Tribune Tower • Cleveland, 616 St. Clair Ave., N. E.
Witco Affiliates: Witco Oil & Gas Company • The Pioneer Asphalt Company • Panhandle Carbon Company
Foreign Office, London, England.



Wasting Rubber Is An Extravagance Which We Can Ill Afford Today

ONE form of waste in the rubber industry which can be easily prevented is that which occurs when rubber stocks stick to untreated liners. This usually results in a waste of some of the rubber and a loss of time, effort and materials when the rubber has to be stripped from the liner and reworked.

The solution to this problem is to use liners treated by the *Capitol Process* — the economical and efficient method which renders cotton piece goods repellent to adhesion of rubber stocks and prolongs the life of the fabric at a low cost.

Send us a fifty or one hundred yard liner and we will give it our CAPITOL LINER TREATMENT without charge, that you may test it in the plant. The all-around savings in rubber stocks and cotton piece goods will be most gratifying.

TEXTILE PROOFERS, Inc.

One Gates Ave., Jersey City, N. J.

DUSTLESS CARBON BLACKS

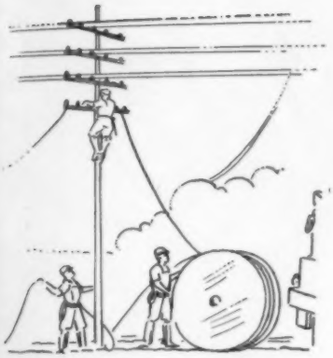
DIXIEDENSED

KOSMOBILE

UNITED CARBON COMPANY

CHARLESTON, W. VIRGINIA

They Are Learning the Possibilities of
PEQUANOC RECLAIMS



INSULATION

SANITATION

FOOD CONSERVATION

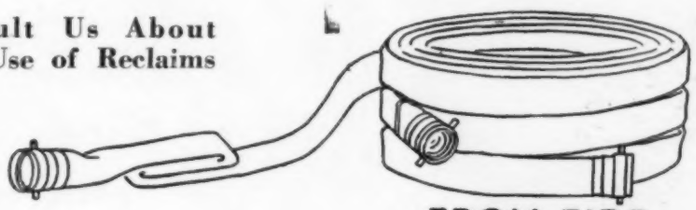
Many new customers who never before used a high percentage of reclaim are finding our uniform Pequanoc Reclaims give them better results and lower production costs than did their former formulas.

What these manufacturers are learning now, about formulas containing a high proportion of reclaim, will be of priceless advantage to them and to their country, in the readjustments of post-war economy.

Consult Us About The Use of Reclaims

PROTECTION

FROM WATER



FROM FIRE

PEQUANOC RUBBER CO.

QUALITY RECLAIMS FOR SPECIFIC PURPOSES

BUTLER **NEW JERSEY**

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E. B. Ross
No. 1 Toronto Street
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Burnett & Co. (London) Ltd.
189 Regent Street
London W. 1, England

encore

BANBURY users come again and again to Interstate for the skillful repairs and hard-surfacing that helps maintain the efficiency and improve the production speed of their mixing rooms . . . Such is the painstaking ability and engineering precision of our work in rebuilding, repairing and hard-surfacing Banburys, more and more users each month come to us . . . If you have a Banbury problem write, wire or phone us today.

SERVING THE RUBBER INDUSTRY

INTERSTATE WELDING SERVICE

Main Plant: 914 Miami Street . . . AKRON, OHIO . . . Phone: JE 7970

EXCLUSIVE SPECIALISTS IN BANBURY MIXER REBUILDING

First Sale of a Thiokol Product

Synthetic Rubber Development is Thirteen Years Old

ON November 29, 1929, the then young Thiokol Corporation received payment from General Motors for the first shipment of Thiokol* synthetic rubber. That transaction was the first of the great synthetic rubber industry that is to fast free America from dependency on imported rubber.

Today Thiokol* synthetic rubber in self-sealing bullet-proof tanks, protective coatings, hose and many other products is helping us win the War. Tires with retreads of Thiokol* keeping war workers' automobiles rolling are the most recent achievement of our thirteen years of synthetic rubber development.

In current production (or in planning future products that will utilize synthetic rubber) be sure to discuss with Thiokol engineers the striking possibilities of Thiokol*—America's first synthetic rubber. A letter or call will bring a quick response. Thiokol Corp., Trenton, N. J.

"AMERICA'S FIRST"

Thiokol

SYNTHETIC RUBBER

*Thiokol Corporation trade mark reg. U.S.

Coming

A New Product To Make Your Re-Claim Go Twice As Far

Long before re-claim limitations were imposed, our research chemists were working on a basic extender that would project unchanged qualities of the original compound into the finished product . . . To do this and still provide twice as much compound bulk was a goal . . . THAT GOAL HAS BEEN ACHIEVED . . . Today we are ready to deliver for your laboratory tests a product, of low cost, which can as much as double your present molded and extruded production possibilities . . . Complete laboratory data has not been completed, but it may be important to you now to write, wire or phone us about this vitally different new Extender . . .

STANDARD

Chemical Company

AKRON SAVINGS AND LOAN BLDG. AKRON, OHIO

HOW TO OFFSET EXTRA HEAT IN HEAVY-DUTY TIRES

Tests in actual formulations demonstrate low heat generating properties of CONTINENTAL "AA"

The cause of most heavy-duty tire failure has long been the heat generated during high speed operation. Today you can offset this *extra* heat with Continental "AA"—a new type black. Test after test in actual formulations has proved conclusively that Continental "AA" contributes *less* to heat generation than do standard blacks. Specially processed, Continental "AA" maintains just the right balance between wear resistance in the tread compound and heat generation in the tire itself. In military, truck and bus tires—tires that must "stand up" in the hottest climates and under the severest operating conditions . . . Continental "AA" fills a vital need.

CONTINENTAL "AA" IS EASIER PROCESSING, TOO!

In still another respect, Continental "AA" is superior to standard grades of black used in passenger car tires. It's easier *processing*. And rigid laboratory control methods insure the same high quality characteristic of all Continental Blacks, whatever the grade. Discover how completely Continental "AA" meets *your* requirements—write for samples today.

TRY CONTINENTAL "AA" IN YOUR BUNA S FORMULATIONS

If you are experimenting with this type synthetic rubber, by all means investigate the characteristics of Continental "AA". Let us send additional samples for your Buna S formulations.

Continental **CARBON COMPANY**

295 MADISON AVENUE • NEW YORK, N. Y.

Akron Sales Office: Peoples Bank Building, Akron, Ohio • SALES REPRESENTATIVES: Ernest Jacoby & Co., Boston, Mass. • Marshall Dill, Los Angeles and San Francisco, Calif.

Announcing

TWO NEW MONSANTO ACCELERATORS

PROMPT deliveries can be made on these two useful new additions to Monsanto's line of "mercaptos," which already includes SANTOCURE, A-46, ELEVEN-SIXTY, UREKA, UREKA-C, and UREKA BLEND B. For samples and experienced technical advice on adapting these accelerators to your needs, inquire: MONSANTO CHEMICAL COMPANY, Rubber Service Department, Akron, Ohio.

MONSANTO CHEMICALS
SERVING INDUSTRY...WHICH SERVES MANKIND

"E" for Excellence... The Navy "E"...denoting the highest service accomplishments of the United States Navy...awarded to Monsanto December 31, 1941, "in recognition of production of ordnance materiel vital to our national defense."

Safeguarding
THE "LINE OF SUPPLY"

A NEW CHAPTER is being written to its story of service to customers as the Titanium Pigment Corporation carries to completion the vast operation in the Adirondack Mountain wilderness which will insure a supply of titanium ore sufficient to maintain the TITANOX plants at the limit of their productive capacity.

To be able to continue the production of white pigments so necessary in making white and light-colored rubber products—to safeguard the titanium pigment "line of supply" to customers' plants—the makers of TITANOX undertook a task of startling magnitude requiring the employment of as many as 1500 men and the expending of many millions of dollars.

In sensing the emergency caused by inability to import titanium ore, and by acting promptly, TITANOX again has indicated its primal concern. That is, complete and effective service to customers.

TITANIUM PIGMENT CORPORATION
SOLE SALES AGENT

111 B'way, New York, N.Y. • 104 S. Michigan Ave., Chicago, Ill. • 350 Townsend St., San Francisco, Cal. • 2472 Enterprise St., Los Angeles, Cal.

TITANOX
TRADE MARK

TITANOX
REG. U.S. PAT. OFF.

HEADLINE NEWS

THERE IS NO SHORTAGE OF BARRETT CARBONEX S

Vital Rubber Extender Saves Up to 15% In Crude and Scrap

With the need for conservation of America's dwindling rubber supply growing daily more vital, the announcement that there is no shortage of Carbonex S is of particular importance to the rubber industry. This improved coal-tar compounding material displays a number of significant properties.

Shown above are some of the many diverse types of articles that are manufactured [illegible] science of rubb[illegible] pounded with

In new and reclaim rubber stocks, Carbonex S* develops these important characteristics:

EXTENDER—up to 15% of the rubber hydrocarbon.

REINFORCING SOFTENER—A highly practical control of toughness.

RAPID EXTRUSION—Minimizes swelling, sagging and flattening.

IMPROVED TEAR RESISTANCE—An important factor to increase wear.

PROMOTES BETTER PROCESSING—Calendering and extruding properties greatly improved.

EXCELLENT AGING QUALITIES—A final great help in conservation.

The research staff of the Barrett Rubber Laboratories will be glad to cooperate with you in the use of Carbonex S and other Barrett rubber compounding materials to meet your requirements. Wire or write today for full information.

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK
ONE OF AMERICA'S GREAT BASIC BUSINESSES

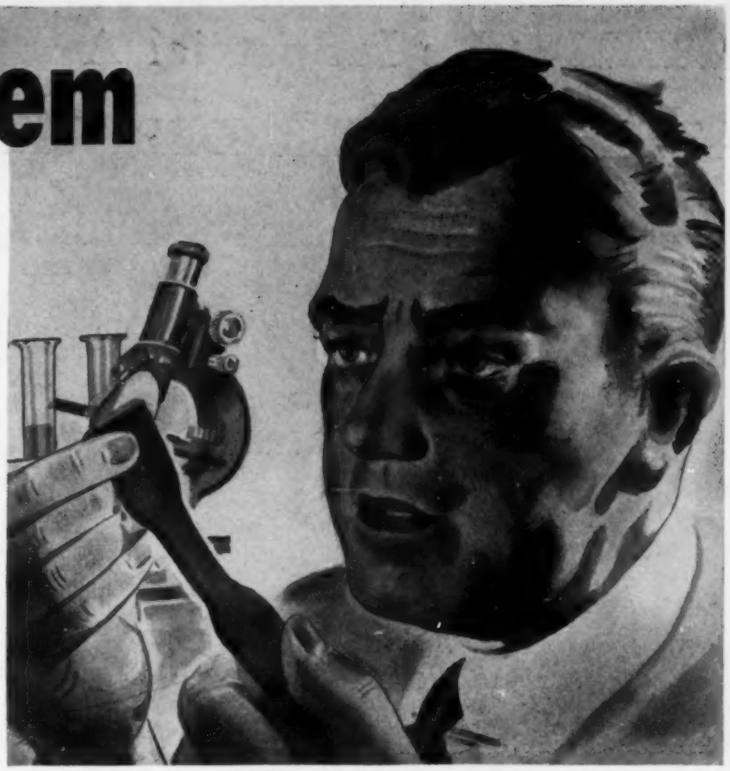
Barrett

*Trademark Reg. U. S. Pat. Off.

The Problem

To Obtain Maximum Utility from Every Pound of our Supply and Production of

Natural Rubber
Synthetic Rubber
Reclaimed Rubber



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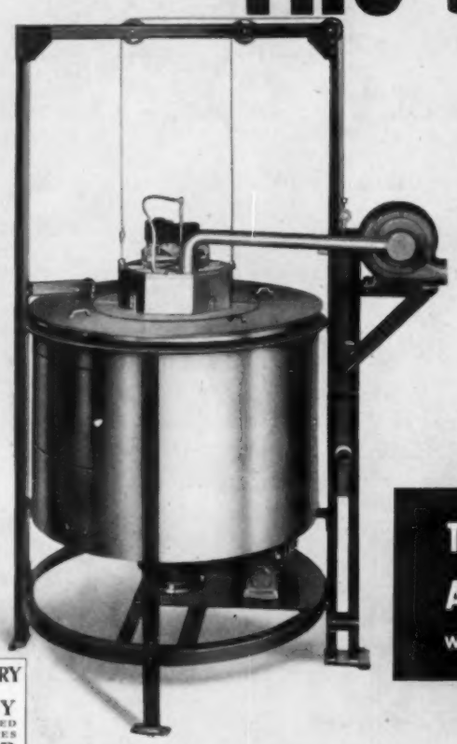

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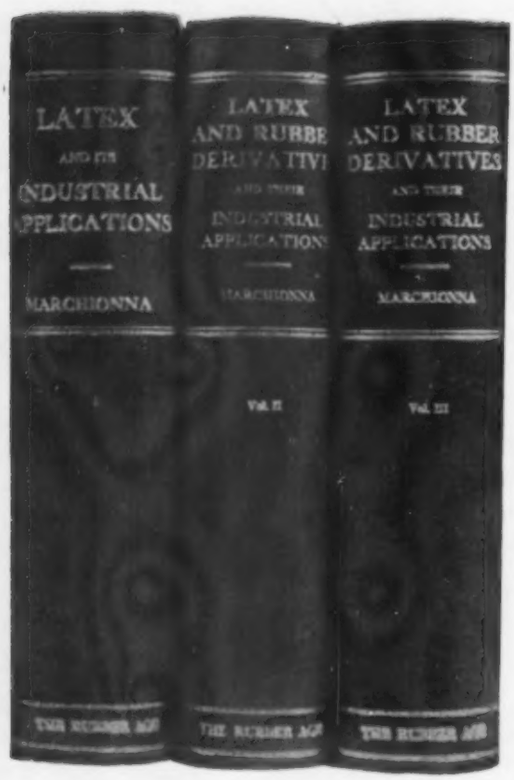
LATEX & RUBBER DERIVATIVES (Vols. II & III)
& Their Industrial Applications.

●

By FREDERICK MARCHIONNA



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The RUBBER AGE

VOL. 51, No. 5 AUGUST, 1942

The Compounding and Processing of Butyl Rubber

By I. E. LIGHTBOWN

Chemical Products Dept., Stanco Distributors, Inc., New York

BUTYL rubber is characterized by extremely low chemical unsaturation. In this it differs from natural rubber and all other known synthetic rubbers. That is to say, from all other known rubbers which are truly vulcanizable. We need not here go into a lengthy discussion of what vulcanization is. It is sufficient to say that in the presence of sulfur, and aided by many of the common rubber accelerators as well as by zinc oxide and fatty acids, Butyl rubber undergoes thermal curing. Its tensile strength is greatly increased; its cold or hot flow suppressed; its elongation reduced; its rigidity moved into a different and higher order of magnitude; its solubility in liquid hydrocarbons altered to simple swelling.

Specifically, Butyl rubber possesses only about one one-hundredth of the available unsaturation found in natural rubber. If this demonstrated fact is kept in mind most of the unusual or unique properties of Butyl rubber will be better understood.

Uncured properties. Uncured, or "as received," Butyl rubber is of a consistency equivalent to moderately well broken-down natural rubber. It has a tendency to flow under its own weight and to adhere to itself, to storage racks and the like. It is wise, therefore, to leave the rubber in its original shipping containers until ready for use. At present, Butyl rubber is being supplied already compounded with 5 parts of zinc oxide and 1.5 parts of sulfur per 100 parts by weight of rubber. Any variation in amount or type of compounding ingredients present will be clearly shown on each container.

Mixing. Batch weights are about the same as for natural rubber. To insure good dispersion, particularly

CHARACTERISTICS OF BUTYL RUBBER

Specific Gravity: 0.91.
Mixing: Same as natural rubber, but no breakdown period necessary.
Processing: Same as rubber.
Vulcanizing: Sulfur and accelerators, same as natural rubber.
Curing Temperature: Above 300° F.
Aging: Excellent, no age resisters necessary.
Uses: Tires, inner tubes, fire hose, steam hose, molded goods, proofed goods, tank linings, conveyor belts. General replacement for natural rubber.

of fine particle size channel gas black, the following procedure is recommended: On a tight cold mill place about ¼ of the rubber used in a full batch. Since no "breakdown" is necessary—or indeed advisable—add cautiously but rapidly an equivalent weight of pigment. If the pigment is carbon black it is well to add the stearic acid along with the black, but otherwise do not add softener at this time. The addition of pigments gives strength to the milling rubber so that as more and more of the powder is added the band around the mill roll becomes smooth and coherent.

As soon as sufficent pigment has been incorporated to form a smooth continuous band the mill rolls should be opened and more rubber added and blended. Then add the remainder of the pigment, slowly at first, but if the rubber is to be fairly heavily loaded (*e. g.*, 50 parts carbon black) the latter third or so of powder can be added rapidly. In general, it is advisable to have a reasonably close mill setting and to keep the rolling bank small by making "cutouts" at the ends of the rolls.

After all of the main pigment has been worked in the oil should be added, then accelerators, zinc oxide, supplementary sulfur, etc. As a variation on this mixing procedure the oil may be incorporated at the halfway point in pigment addition if the recipe calls for large volumes of the latter.

The important thing to be remembered about mixing is that uncompounded Butyl rubber is tender at milling temperatures but that it is given strength by the proper incorporation of pigments.

If several of the same type of compounds are to be mixed in succession, the early part of the mixing procedure, as it has been described in this outline, may be eliminated by adding a "seed" from a former batch.

Calendering. Butyl rubber compounds can be frictioned, skimmed, or sheeted with but little difficulty. Typical tire carcass compounds which may be used for both friction and skim-coat will be something like this:

	#1	#2
Butyl rubber	100.0	100.0
Zinc Oxide	5.0	5.0
Stearic Acid	2.0	2.0
Sulfur	2.0	2.0
Tetramethylthiuramdisulfide	1.0	1.0
Mercaptobenzothiazole	0.5	0.5
Furnace Black	35.0	..
Softener *	5 to 10	..
Soft Black	..	50.0

* Medium process oil or Dow's 6811 oil.

It should be pointed out that Butyl rubber adheres to the cooler roll, so that the middle roll of the calender should be somewhat cooler than the top roll.

Typical calender roll temperatures for frictioning are:

Top	190-200° F.
Middle	170-180° F.
Bottom	200-210° F.

For skim-coating the temperature of all rolls should be about 180° F. and for sheeting a few degrees hotter.

Extruding. Butyl rubber extrudes rapidly and smoothly. The extruder die and head should be hot. Since Butyl rubber is rather tough and stiff until slightly warm, the barrel should not be stone cold. The experienced operator will quickly learn the proper temperature which will give sufficient forward thrust to the stock without having it so hot as to be mushy or so cold as to be tough.

Compounding. There is one essential fact which must be kept in mind by the Butyl rubber compounder. It is quite simple. If it is remembered, Butyl rubber compounding is as straightforward as natural rubber compounding. If it is forgotten or not known, perplexing difficulties will be met with sooner or later. It is this: never use a softener, or an organic compounding ingredient which contains aliphatic unsaturation. Or, never use a softener or an organic compounding ingredient in which may be present as impurities materials which contain aliphatic unsaturation. Stated another way: *always use softeners of low iodine number.*

If this is not followed, if for example 5 to 10 parts of pine tar or rosin are compounded into Butyl rubber, the resulting mixture will not cure. This is apparently because the Butyl rubber polymer is itself of so low an unsaturation that any other unsaturate seriously interferes with the desired vulcanization.

Among those softeners which should *not* be used are: Pine Tar; Rosin; Factice; Impure mineral rubber; Unsaturated fatty acids.

Among those softeners which may be used are: Medium process oil (low iodine number); Dibenzyl ether; Para cymene; Stearic Acid; Other saturated fatty acids; Halogenated Diphenyl Oxide.

From this list of permissible softeners it will be seen that aromatic softeners do not inhibit cure. They must, of course, be moderately pure.

In general very little softener is necessary, 5 to 10% being the upper range. Certain softeners not only fulfill their natural function of plasticization but also increase the resiliency of the cured stock. These are usually liquids of low viscosity and sufficiently high boiling point. The latter characteristic is, of course, necessary so that they do not boil off during cure.

As is true of virtually all rubbers, synthetic or natural, black pigments confer the best properties to the vulcanizate. But other pigments such as whiting, clay, zinc oxide, etc., may be used where necessary.

A study of the effect on cure rate, tensile, aging, etc., of various pigments appears in Table I. Where proprietary names are given the intent is to aid the compounder. Other pigments, under other names, may be as good as those shown; or even better. The base recipe used was:

BASE RECIPE

Butyl rubber	100.
Zinc Oxide	5.
Sulfur	1.5
Stearic Acid	3.
Tetramethylthiuramdisulfide	1.0
Pigment	as shown

Vulcanization. Butyl rubber should be cured at higher temperatures than are ordinarily used for natural rubber. Sixty to sixty-five pounds of steam (307° F. to 311° F.) is recommended. To determine the proper length of cure on any particular stock it is always wise to vulcanize several test sheets in the laboratory for different time intervals. As with rubber the proper curing time is usually determined from optimum tensile strength.

Butyl rubber compounds rise gradually in tensile strength as the time of cure is increased until a maxi-

TABLE I—Butyl Rubber Loading Studies (For Base Recipe See Page Opposite)

Type Loading	KOSMOBILE 66						GASTEX						P-33						CABOT No. 9					
Volume Loading	10	20	30	40	60	80	10	20	30	40	60	80	10	20	30	40	60	80	10	20	30	40	60	80
40' Cure at 307°F.																								
Tensile Strength	2570	2583	2420	2186	1616	1220	2427	2233	1685	1475	1041	951	2770	2387	1963	1688	1278	1210	2546	2596	2400	2070	1535	1196
Modulus at 400%	217	322	511	651	846	1130	327	539	688	1032	967	-	227	278	357	424	553	640	211	392	522	775	1118	1166
Elongation at Break	885	910	905	840	730	490	785	760	680	635	490	370	830	800	770	750	700	687	860	900	925	785	635	460
Shore Hardness	40	45	55	60	70	80	40	45	50	60	65	76	35	42	45	50	58	65	37	45	50	57	70	85
60' Cure at 307°F.																								
Tensile Strength	2840	2753	2686	2353	1815	1450	2473	2190	2183	1445	1133	985	2863	2337	1881	1695	1281	1220	2850	2596	2420	2040	1620	1335
Modulus at 400%	281	461	610	814	1171	1435	335	547	657	1073	1038	-	276	268	422	500	657	681	306	492	642	972	1256	1306
Elongation at Break	857	857	883	827	657	410	770	777	707	603	490	290	845	757	720	710	670	670	843	863	840	730	590	407
Shore Hardness	40	45	55	60	70	85	40	45	46	59	67	77	40	43	47	52	60	70	40	47	52	60	72	85
Heat Aging 48 Hours at 250°F. in Air Oven																								
60' Cure at 307°F.																								
Tensile after Aging	2446	1988	1671	1673	1651	1450	2038	1927	1598	1303	1180	1126	1620	1631	1566	1448	1103	856	2080	2466	1402	1500	1488	1621
Elong. after Aging	760	745	712	640	470	300	760	655	570	500	303	230	770	750	720	690	610	530	725	720	690	510	400	250
Tensile Retained %	86.4	68.4	62.2	71	91	100	82.5	88.0	73.0	90.3	104	114.5	55.5	69.3	83.3	85.5	86	70	73	95.5	57.5	73.5	91.7	121.5
Elong. Retained %	88.5	82	80.8	77.5	73.5	73.2	98.8	85.6	81	83	62	79.5	91	99.3	100	97.2	91.2	79.2	86	83.5	82.2	70	68	61.5
Shore Hardness	40	45	50	60	80	90																		

Type Loading	CALCENE						SILENE				GILDER'S WHITING					CELITE No. 270				
Volume Loading	10	20	30	40	60	80	10	20	30	40	10	20	30	40	60	10	20	30	40	60
40' Cure at 307°F.																				
Tensile Strength	2610	2306	1873	1478	1081	-	1513	1313	989	976	2200	1710	360	550	240	1988	1545	1113	1072	528
Modulus at 400%	60	78	78	77	75	-	57	112	170	362	59	58	98	-	50	123	119	175	172	117
Elong. at Break	910	900	870	870	815	-	945	870	780	670	890	920	800	920	710	870	830	790	800	760
Shore Hardness	35	38	36	36	37	-	39	40	46	50	38	35	31	36	36	35	43	47	53	60
60' Cure at 307°F.																				
Tensile Strength	2653	2170	1970	1455	966	-	1701	1358	1033	1040	2470	1750	1550	1190	940	2070	1647	1348	1050	628
Modulus at 400%	96	60	60	58	94	-	57	116	202	418	59	57	117	60	60	120	156	175	182	133
Elong. at Break	920	870	840	840	770	-	930	840	760	650	880	840	820	830	810	840	830	780	780	770
Shore Hardness	35	40	37	39	38	-	42	41	46	53	40	38	40	43	46	35	42	48	54	59
Heat Aging 48 Hours at 250°F. in Air Oven																				
60' Cure at 307°F.																				
Tens. after Aging	1280	1243	1113	1053	901	-	988	803	569	452	1400	1090	880	740	650	995	737	713	539	389
Elong. " "	865	845	815	815	805	-	600	705	925	1100	960	930	890	810	810	960	900	850	840	700
% Tens. Retained	49.5	57.4	56.5	72.5	93.3	-	58	59	55	43	57	62	57	62	69	48	45	53	51	62
% Elong. "	94.5	92.3	97.5	97	104.5	-	64	84	122	169	109	111	108	98	100	114	108	109	108	91
Shore Hardness	-	-	-	-	-	-	-	-	-	-	30	34	35	40	40	31	35	40	43	55

BUTYL RUBBER RECIPES

Tire Tread

Butyl rubber	100.00
Zinc Oxide	5.00
Stearic Acid	3.00
Sulfur	2.00
Tetramethylthiuramdisulfide	1.00
Mercaptobenzothiazole	.50
Gas Black *	50-60

(*) Soft channel black such as Cabot #9 recommended.

Tire Carcass

Butyl rubber	100.00
Zinc Oxide	5.00
Stearic Acid	2.00
Sulfur	2.00
Tetramethylthiuramdisulfide	1.00
Mercaptobenzothiazole	.50
Furnace black	35.00
Softener **	5-10

(**) Medium process oil; Forum 40; Dow's 6811 oil, etc.

Inner Tube

Butyl rubber	100.00
Zinc Oxide	5.00
Stearic Acid	2.00
Sulfur	2.00
Tetramethylthiuramdisulfide	1.00
Mercaptobenzothiazole	0.5
Furnace black	50.0
Softener **	5-10

(**) Medium process oil; Forum 40; Dow's 6811 oil, etc.

Molded Goods

Butyl rubber	100.00
Zinc Oxide	5.00
Stearic Acid	3.00
Sulfur	2.00
Tetramethylthiuramdisulfide	1.00
Mercaptobenzothiazole	0.5
Soft Black	50-150

Extruded Goods

Butyl rubber	100.00
Zinc Oxide	5.00
Stearic Acid	3.00
Sulfur	2.00
Tetramethylthiuramdisulfide	1.00
Mercaptobenzothiazole	0.5
Paraffin	4.0
Softener **	5.0
Soft black	50 to 150

(**) Medium process oil; Forum 40; Dow's 6811 oil, etc.

Cable Insulation

Butyl rubber	100.00
Zinc Oxide	5.00
Stearic Acid	3.00
Sulfur	2.00
Tetramethylthiuramdisulfide	1.00
Mercaptobenzothiazole	0.5
Clay	100.00
Whiting	50.00
Paraffin	3.00
Process Oil	5.00

mum is reached, at which point the tensile is fairly constant (flat curing) although the ultimate elongation continues to decrease as the curing time is lengthened. But tensile strength should not always be used as the only criterion for determining length of cure. Where, for example, low heat build-up (low hysteresis) or high modulus is desired an overcure, from the standpoint of tensile strength, should be used.

Butyl rubber is most effectively vulcanized through the use of thiuram type accelerators supplemented by thiazoles. Other accelerator types may be used but they are not so effective. The value of a thiazole along with the thiuram is not always readily obvious. Mercaptobenzothiazole, for example, used along with tetramethylthiuramdisulfide does not increase the rate of cure or the ultimate tensile. If tetramethylthiuramdisulfide were used alone these values would be about the same. But the presence of a thiazole does decrease the heat build-up and reduce the hot flow.

A typical recipe for a pure gum stock is:

Butyl rubber	100.00
Zinc Oxide	5.00
Sulfur	1.50
Stearic Acid	3.00
Tetramethylthiuramdisulfide	1.00
Mercaptobenzothiazole	0.50

Cure 45 minutes at 65 lbs. steam (311°F.)
Typical tensile—3000-3500 lbs./sq. in.
Typical elongation—800 to 1000%

It will be seen that Butyl rubber, in the pure gum form, has a tensile strength comparable with pure gum natural rubber. In many of the other synthetic rubbers, *e.g.*, butadiene interpolymer (Buna types), a very low tensile, in the neighborhood of 800 lbs./sq. in., is the most that can be expected from a pure gum vulcanizate. But the Bunas are greatly strengthened by the incorporation of pigments, particularly by carbon black, so that the tensile is increased to 3500 lbs./sq. in. or more when 40 to 50 parts of channel gas black are present.

Butyl rubber also is reinforced by carbon black, but this reinforcement is not manifested by tensile increase. Indeed, the tensile of Butyl rubber is decreased as more and more black is added. But Butyl rubber containing carbon black is much more abrasion resistant than pure gum Butyl. It is also tougher, more tear resistant, of higher modulus, and better resists cutting. Stated in more practical terms Butyl rubber containing carbon black will make a serviceable tire tread whereas pure gum Butyl will not.

Cements. Ordinary cements or doughs for spreading are most readily made by using petroleum naphtha as the solvent. Aromatic solvents such as benzol or toluol are also effective but not so good as naphtha. This is of advantage not only because the naphthas are more available but because they are less toxic.

It is not necessary or advisable to use long breakdown milling periods for the manufacture of Butyl rubber cements. As has been pointed out previously no initial mastication is necessary prior to mill mixing. This holds for Butyl rubber cements as well as for tire compounds, molded goods compounds and the like.

Tack. Butyl rubber is, by nature, a tacky polymer. Building and plying operations are simple. Butyl tires can be formed on a drum about as easily as rubber. It is usually not necessary to "freshen" surfaces, but if it is occasionally found advisable to do so petroleum naphtha is again suggested, used sparingly.

Mixtures with other Polymers. Don't mix Butyl rubber with natural rubber or other vulcanizable synthetic rubbers; they don't covulcanize. This is a rule with but few exceptions. The main exception is in the manufacture of tie gums for adhering Butyl to natural rubber. For such tie gums use about fifty parts of Butyl rubber to the same amount of natural rubber. It is well, also, to have 25 to 50 parts of soft black present. Accelerate with 1.0 part a thiazole.

Properties of Vulcanized Butyl Rubber. The following are outstanding: Age resistance is excellent, unnecessary to add anti-oxidants; Electrical properties make Butyl rubber outstanding for cable insulation; Water absorption very low; Resistant to acids including strong H_2SO_4 and HNO_3; Excellent flex-resistance: Low rebound at room temperature; High rebound at elevated temperature; Heat resistance is excellent; Swells in petroleum or coal tar solvents the same as natural rubber; Does not swell in most vegetable and animal fats and oils; Highly impermeable to gases such as hydrogen, helium, and carbon dioxide.

Soft Rubber-like Plastics From Cellulose Derivatives

By DAVID R. WIGGAM

Cellulose Products Dept.,
Hercules Powder Co., Inc.
Wilmington, Delaware

THE production of rigid plastics from cellulose derivatives, such as cellulose acetate, nitrocellulose, and ethyl cellulose, is a well-established art. Articles of this general type may be illustrated by fountain pen barrels, toothbrush handles, as well as almost limitless other applications.

These cellulose derivatives have properties which also make them suitable for use in the production of less rigid plastics. The wider range of usefulness of soft plastics has been largely overlooked except in a few instances, such as the use of nitrocellulose in artificial leather. This possibility of using cellulose derivatives in soft rubber-like plastics has particular significance today because of the growing scarcity of natural rubber.

Cellulose derivatives, such as ethyl cellulose, may be compounded with chemical and oil plasticizers to yield compositions having many of the qualities which have made rubber applicable in such a wide variety of uses. These compositions can be made to be tough, pliable, flexible, and thermoplastic. Their handling is different from that of rubber. Vulcanization is unneces-

DATA FROM TYPICAL SOFT PLASTICS

(b = brittle; c = clear; f = flexible; o = opaque; vh = very hazy; w = wrinkled)

	Ethyl Cellulose			*Cellulose Acetate*		*Rubber*	
1. Water Absorption:							
Percent of Original Weight: After 24 Hours	105.1	104.9	104.2	97.4	90.9	112.8	100.9
Percent of Original Weight: After 48 Hours	105.3	111.5	104.9	94.9	86.8	115.3	101.1
Percent of Original Weight: After 70 Hours	106.0	112.8	106.3	92.8	84.2	117.6	101.2
2. Dimensional Stability in Boiling Water:							
Percent of Original Length: After 10 Minutes	98.0	99.5	...	w	w	102.0	100.0
Percent of Original Width: After 10 Minutes	101.0	101.0	...	w	w	103.9	100.0
Percent of Original Thickness: After 10 Minutes	104.0	103.6	...	w	w	100.0	100.0
Appearance After Removal From Water	c	vh	...	o	o	*	*
3. Dimensional Stability in Water at Room Temperature:							
Percent of Original Length: After One Week	102.4	107.6	...	94.5	95.0	110.0	101.0
Percent of Original Width: After One Week	103.0	107.5	...	96.2	93.2	109.2	100.0
Percent of Original Thickness: After One Week	106.2	107.3	...	96.7	90.0	112.5	101.5
4. Elmendorf Tear Test: Force-Grams To Tear 1.25 Inches	68	19	41	29	29	**	**
5. Abrasion Resistance: Revolutions/mil Thickness	23.4	3.7	75.5	117	94	37	49
6. Pfund Hardness	.367	.712	...	.775	.285	.8+	.8+
7. Penetration Melting Point: Degrees Centigrade	66	...	...	123	30	102	†
8. Shore Hardness: Shore Values	31	29	27	32	34	‡	90
9. Tensile Strength: Pounds Per Cross Sectional Square Inch	1700	1170	2290	3400	2300	140	470
10. Percent Elongation	103	86	123	109	115	760	575
11. Permanent Set:							
Percent of Total Stretch Retained From Quick Tension, 21° C. (Scott Tester Dh-2)	9	6	24.2	45	75	0	0
Percent Total Stretch Retained From Slow Tension, 21° C.	11.5	81	...	100	100	0	0
Percent Total Stretch Retained From Slow Tension, 50° C.	100	100	...	90	83	0	0
12. Flexibility at −20° C.: Number Double Folds (M. I. T. Flex Tester)	170	—	97	40	38	65,000+	†
13. Flexibility at Approximately −78° C.: (Pinch Test)	b	f	b	b	b	f	b
14. Burning Rate: Seconds for 3-inch Length	71	28	...	38	44	20	66

* Opaque initially. ** Not run. † Sample too thick. ‡ Sample too thin.

sary. This usually results in faster processing and higher production rates. On the other hand, the advantage of converting the materials to less soluble forms by means of vulcanization is not possible with the soft plastics. In most cases, however, solubility characteristics can be controlled by proper choice of the cellulose derivative and its modifying agents.

Possible formulations are almost limitless since each plasticizer gives somewhat different characteristics. Furthermore, formulations may be modified still further by addition of waxes, resins, or pigments.

Some of these soft-plasticized cellulose formulations have been tested in the laboratory in comparison with two types of widely used rubber compositions. The accompanying table contains the results obtained on testing three of the ethyl cellulose and two of the cellulose acetate unpigmented formulations, along with comparable data obtained on testing the two rubbers. One of these rubbers was an unpigmented stock, such as is commonly used in rubber gloves and baby pants; the other rubber stock was a black pigmented one similar to that used in inner tubes for automobile tires.

The cellulose derivatives can be formulated to yield products having some qualities equal to or even superior to those of rubber compositions. For example, formulations have been made with abrasion resistance several times greater than that of the two rubber samples tested.

Their degree of elongation is limited, however, when compared to rubber; and on the same basis of comparison, their "bounce" is low. They can be formulated to show only minor permanent deformation when subjected to stress at room temperature.

Water resistance comparable to that of compounded rubbers can be built into these soft plastics. They can be made to show good pliability at low temperatures. For example, at a temperature where the rubbers were stiff, boardy, and brittle, the soft plastics were still pliable and tough.

Good chemical resistance is readily obtainable. To illustrate, the two rubbers used for comparison purposes (see Table) became brittle after only seven minutes exposure in a stream of air containing three per cent ozone. Some of the cellulose plastics were not brittle and appeared unaffected after 96 hours exposure to the same concentration of ozone. They also showed good resistance to dilute alkalies.

Other desirable properties may be built into these soft plastics by proper choice of modifying agents. They can be made oil-proof or gasoline-proof. Flameproofness may be added by use of proper plasticizer. They can be formulated to be clear or pigmented, to cover the entire range of transparent, translucent, or opaque colors.

Both cellulose acetate and ethyl cellulose compositions are readily fabricated by injection or extrusion molding or by hot calendering. They can be applied also in solution or in a solvent-jelled state as is done with nitro-cellulose in artificial leather.

Data in the accompanying table are presented to illustrate the characteristics which the soft rubber-like plastics possess. These formulations were made from ethyl cellulose and cellulose acetate, all without the use of any solvent. Formulations from nitrocellulose, however, would require solvent and a curing step in the production cycle because this cellulose derivative must be worked at lower temperatures due to its lower stability at elevated temperatures.

It has been pointed out that both hard and soft plastics may be made by proper choice of plasticizer. Cottonseed oil or raw castor oil are examples of oil plasticizers which may be used with ethyl cellulose. Dibutyl phthalate and Hercolyn are examples of chemical plasticizers. Dimethyl and diethyl phthalates and Santicizer M-17 (methyl phthalyl ethyl glycollate) are examples for use with cellulose acetate.

It is believed these soft plastics which can be made from ethyl cellulose, cellulose acetate, and nitrocellulose can be used to advantage today in supplying essential needs of both the armed forces and civilians.

Number 600 Extender

A NEW EXTENDING material—called Number 600 Extender—has been introduced by the Standard Chemical Co., Akron, Ohio. Described as a special modified vegetable oil, the new material serves as an extender and a plasticizer for both the Buna S and Buna N-type synthetic rubbers, as well as for reclaimed and natural rubbers. The following information on the new material is supplied by Standard Chemical:

Thirty parts of Number 600 Extender used in tests as a plasticizer in a typical channel black reinforced Buna N-type stock gave a tensile of over 3,000 pounds, an elongation of over 500%, and a durometer hardness of approximately 70. The resulting compound showed a tendency toward volume increase during the gasoline immersion test, but the characteristic of Number 600 Extender of serving as a compensator for plasticizer extraction was instrumental in maintaining constant volume.

In dry, tough reclaim stocks, Number 600 Extender has a pronounced softening and plasticizing action and accordingly aids in the processing and extrusion of such compounds. Care must be exercised, however, when using the extender in tacky reclaimed compounds because of its plasticizing properties.

Tensiles from 200 to 500 pounds greater have been secured from compounds using Number 600 Extender as compared with those using other types of extenders or rubber substitutes. For this reason, the new material serves effectively in aiding greater volume loadings.

Although some users of Number 600 Extender have indicated that the material can and has been used as a complete rubber replacement in certain types of stocks, laboratory tests have not yet been completed substantiating these claims. It is known, however, that the extender has the unique property of banding on the mill and certain types of accelerators could effect an action that would make vulcanizing possible.

The new extender is somewhat thermoplastic at elevated temperatures and mill rolls should be kept cool when working it. Pigment fillers should be added as soon as possible in order to effect efficient incorporation. Silene has proved especially effective as a reinforcing material in compounds of low rubber content. It not only provides high tensile and tear-resisting properties, but serves also to dry out such compounds.

Division of Rubber Chemistry Meets in Buffalo on September 10 and 11

SYNTHETIC RUBBER will be the keynote of the meeting of the Division of Rubber Chemistry, A.C.S., which will be held in Buffalo, N. Y., on September 10 and 11, in conjunction with the 104th meeting of the parent society. Convention headquarters will be maintained at the Hotel Statler, but headquarters for the Rubber Division will be at the Hotel Lafayette where all of the Division's technical sessions will be held. The division banquet, which will be held on Thursday evening, September 10, will be at the Statler.

The Rubber Division will hold four full sessions, starting on Thursday morning, September 10, and finishing up in the late afternoon of Friday, September 11. Twenty-eight papers in all are scheduled, of which 13 will be general papers and 15 part of a Symposium on the Compounding and Processing of Synthetic Rubber. An open forum will be a feature of the symposium. The general papers will be presented at the morning and afternoon sessions on Thursday, September 10, while the symposium papers will be given during the Friday sessions.

Special Symposium at General Meeting

In addition to the Division's two-day sessions, a special symposium devoted to a discussion of synthetic rubber will be a feature of the parent society's General Meeting, to be held on Wednesday, September 9, at the Municipal Auditorium. At this symposium, E. R. Weidlein, technical consultant on synthetic rubber to the Rubber Reserve Co., will speak on "Progress of Synthetic Rubber Production;" Albert L. Elder, of the Materials Division of W.P.B., on "Progress of Butadiene Production;" and Willard H. Dow, president of Dow Chemical Co., on "Progress of Styrene Production." The symposium, therefore, will represent a progress report and members planning to attend the meeting of the Rubber Division should arrange to be in Buffalo by the morning of Wednesday, September 9.

All local arrangements are in the hands of the Buffalo Rubber Group. The banquet, which will feature a varied program of entertainment, is in the hands of John Plumb and Howard Wiley, both of the U. S. Rubber Reclaiming Co., chairman and secretary, respectively, of the Buffalo group. Burt W. Wetherbee, of the Globe Woven Belting Co., is chairman of registration for the Rubber Division, and will be assisted by Wayne Nelson, of the Depew Container Corp., and H. J. D'Innocenzo, of Pierce & Stevens, Inc. For the convenience of Division members, Mr. Wetherbee has arranged to have a staff on hand from 8:00 to 12:00 A.M. on September 9 and 10.

Abstracts of the technical papers, together with the names of the authors and their company connections, follow:

Program of the
DIVISION OF RUBBER CHEMISTRY
AMERICAN CHEMICAL SOCIETY

Hotel Lafayette—Buffalo, N. Y.
September 10 and 11, 1942

Wednesday Afternoon—September 9

2:00 P.M.—General Meeting, A.C.S., Municipal Auditorium (Featuring a Symposium on Synthetic Rubber in the Form of a Progress Report.)

Thursday Morning—September 10

9:00 A.M.—General Papers.

Thursday Afternoon—September 10

2:00 P.M.—General Papers.

Thursday Evening—September 10

6:30 P.M.—Division Banquet, Hotel Statler.

Friday Morning—September 11

9:00 A.M.—Symposium on Compounding and Processing of Synthetic Rubber.

Friday Afternoon—September 11

1:30 P.M.—Symposium (Continued).
4:15 P.M.—Business Meeting.

ABSTRACTS OF PAPERS

Thursday Morning—September 10

9:00 A.M.—Introduction. ***J. N. Street, Chairman.***

9:10 A.M.—Methyl Ethyl Ketone Extraction of Rubber. ***La Verne E. Cheyney (Goodyear Tire & Rubber Co., Akron, Ohio).***

Methyl ethyl ketone has been reported as a swelling agent for raw rubber, but quantitative data are lacking. This investigation was concerned with the comparative extracts of methyl ethyl ketone and acetone, on samples of both vulcanized and unvulcanized rubber. The extractions were carried out both continuously and discontinuously.

Three samples of raw rubber were included: (1) a smoked sheet, which gave practically the same extract with methyl ethyl ketone as with acetone up to 16 hours' continuous extraction, but which swelled markedly after that time; (2) a pale crepe, which behaved similarly; (3) a flat bark crepe, which swelled very markedly in methyl ethyl ketone and showed no relation between the extract values in the two liquids. Discontinuous extraction definitely increased the amount of total extract in all cases, as well as the rate of extraction.

Three samples of vulcanized rubber gave in all cases higher extract values with methyl ethyl ketone than with acetone.

The swelling tendency is evident, but repressed. The effect of discontinuous extraction is less than with the raw rubbers.

Two samples of reclaimed rubber gave methyl ethyl ketone extracts which were much greater than the corresponding acetone extracts. The values continue to increase on longer extraction, either continuous or discontinuous, although considerably more rapidly with discontinuous extraction. The analogy with the chloroform extract of reclaimed rubber is noted.

9:25 A.M.—The Effect of Temperature and Pressure on the Oxygen Pressure Test. I. A Comparison of Aging at 70° and 80° C. II. The Effect of Oxygen Pressure on Aging at 80° C. ***A. M. Neal, H. G. Bimmerman, and J. R. Vincent (E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.).***

The recent tendency to decrease the time required to obtain aging data by increasing the temperature of the aging test raises the important question of the correlation of new test data with previous experience. In an attempt to provide quantitative data the authors have studied the accelerated aging of

(a) a normal sulfur stock accelerated with an aldehydeamine
(b) a normal sulfur stock accelerated with a thiazole
(c) a low sulfur stock accelerated with a thiazole
(d) a wire stock having no added sulfur
(e) a neoprene Type E stock
(f) a neoprene Type GN stock

I. The stocks were tested at 300 psi oxygen pressure at both 70° and 80° C. The values of the temperature coefficient for the stocks studied vary from 1.63 to 3.41. In general the effect of increasing the time of cure is small, but tends to increase the temperature coefficient.

The data presented show conclusively that although the use of the proposed aging conditions of 80° C. and 300 psi oxygen pressure will markedly increase the rate of aging, there is no general method of correlating the new test data with existing specifications based on aging at 70° C. and 300 psi oxygen pressure. It would appear necessary at a minimum to establish such a relationship for each type of stock under consideration.

II. The investigation was further extended to cover the effect of oxygen pressure on aging at 80° C. The stocks were studied at 0.5, 50, 150, and 300 psi gage pressure. In general, the rate of deterioration increases with increasing oxygen pressure, but is not directly proportional to it. The maximum change in gage pressure represents a 20.7-fold increase in oxygen concentration; however, the maximum increase in deterioration obtained experimentally varied for different stocks from 1.09 to 6.98. These values indicate a great difference in the response of different stocks to changes in oxygen concentration. The effect of the state of cure on the "pressure coefficient" is much greater than on the temperature coefficient; it is dependent upon the individual stock and further on the pressure range over which it is calculated. An increase in time of cure may increase or decrease the "pressure coefficient."

These data show conclusively that any changes in pressure in the oxygen pressure test at 80° C. would necessitate a complete review of commercial specifications, and that this must be done for each stock and for each cure on any given stock.

9:45 A.M.—Growing Rubber in North America. ***H. L. Trumbull (B. F. Goodrich Co., Akron, Ohio).***

No abstract available.

10:30 A.M.—USF-Rubber, A New Crude Rubber. ***J. McGavack, C. E. Linscott, and J. W. Haefele (U. S. Rubber Co., Passaic, N. J.).***

USF-rubber is a new crude rubber of improved properties. It has been designed to satisfy the demands expressed over a considerable period of years by the consumers of crude rubber. The points of superiority built into this material are as follows: (a) uniformity; (b) softness; (c) flex-cracking; (d) color; (e) cleanliness.

The above properties rest on two foundations: (1) an effective method for the preservation of the latex and of the rubber; (2) an improved process for the preparation of the rubber.

The special features of this new process are: (1) removal of dirt from the preserved latex by a sedimentation step; (2) use of a blended latex—the blend is maintained in a definite total solids range; (3) formation of flocs of sufficient stability to be washed and creamed before conversion to coagulum.

11:00 A.M.—A Motion Picture Study of Balata and Hevea Latices with Some Observations on Buna S and Neoprene Latices. ***Francis F. Lucas (Bell Telephone Laboratories, New York, N. Y.).***

Relative positions of rubber latex particles as disclosed by ultraviolet micrographs suggested that colloidal dispersions consist of an orderly arrangement of particles controlled by forces acting between particles. The commonly held explanation of Brownian motion is based on the assumption of the molecular action of the liquid. Preliminary investigation by improvised apparatus showed that structural arrangements exist when particles are in Brownian motion.

The design of precision motion picture apparatus was undertaken embodying color-differential illumination which was perfected for the purpose. Description of apparatus, technique of use, and the preparation of material for study is given. The color system reveals the particles in color against a field of the complementary color. Three-color combinations are employed, resulting in symmetrical coloring of particles and introducing the third dimension.

Motions of the particles can be clearly followed. A common element of structure consists of a primary particle and one or more satellites gyrating about it. A satellite itself may have one or more satellites. Particles do not migrate but remain indefinitely in relatively the same location. Triplets and quads are arrangements of particles of about equal mass. The smaller particles are more active and change partners readily. Dark spaces or "holes" which are devoid of particles prevail in the dispersion.

Chains form, break up, and others form in a constantly changing pattern. Fast motion pictures show the mechanism. Pattern is suggestive of dendritic structures. At times whorls form.

Very dilute dispersions show simple units of structure and their motion. Activity of motion increases with the concentration of particles. A single isolated particle exhibits little motion.

Time studies show how particles unite to form chains or groups, and the mechanism of merging to form a single large spherical particle. Typical examples of merging particles are illustrated.

Cataphoresis experiments have been filmed. They show migration to the anode. Large and small particles travel at same rate. Structural formations are unaffected by applied potential.

Buna S and neoprene latices have been filmed. Particle sizes are very small and uniform. Motions are faster than natural latices. Chains and dark spaces form and disappear in a constantly changing pattern. Merging of particles to form irregular shaped particles ultimately becoming spherical apparently takes place. Some latices appear light-sensitive when much diluted and the particles gradually disappear.

11:50 A.M.—The Natural Aging of Reclaimed Rubber. ***Henry F. Palmer and Robert H. Crossley (Xylos Rubber Co., Akron, Ohio).***

Lots of three typical reclaims were set aside from production, and at periodic intervals, as these reclaims aged, acetone and chloroform extracts, alkalinities, milling tests, reclaim-sulfur tests, and tests in typical test formulas were obtained. It was found that as the reclaims aged they became less tacky and harder to break down during milling. This appeared to be less true of reclaims having high alkalinity than of those having low alkalinity. The acetone ex-

tracts of the reclaims remained constant with increasing age, but the chloroform extracts and alkalinities decreased. These changes were accompanied by small variations in physical properties in test formulas, but no significant changes in quality were observed in the reclaims up to one year of age.

A further experiment was conducted by setting aside a pile of scrap tires and manufacturing therefrom four separate lots of whole tire reclaim at such intervals that fresh and aged reclaim could be tested simultaneously. Tests of aged versus fresh reclaim were obtained in the laboratory in a typical tread test formula, and in the treads of tires which were road tested on test cars. It was found that there was no significant difference in quality between tires containing reclaim 15 months old and 3 months old.

Thursday Afternoon—September 10

2:00 P.M.—Vibration Properties of Rubber: Dependence on Temperature. ***R. B. Stambaugh (Goodyear Tire and Rubber Co., Akron, Ohio).***

An electrical vibrator for measuring dynamic properties of rubberlike materials at various temperatures is described. Dynamic modulus, internal friction, and dynamic resilience are measured over a range of frequencies from 30 to 100 cycles per second, and of temperature from —30° to +120° C. Curves showing the variation of these properties with frequency and temperature are reproduced for rubber, butadiene-acrylonitrile, and butadiene-styrene copolymers in several ratios, Thiokol and neoprene, all loaded with 40 parts by weight of gas black. In addition, curves for gum rubber are included.

The dynamic modulus and resilience for all these rubberlike materials are found to be independent of the frequency, while the internal friction is approximately inversely proportional to frequency. The modulus decreases as temperature increases. Thus some synthetic stocks, which were very hard and non-resilient at room temperatures, behave at high temperatures very much like rubber at room temperature.

The dependence of the internal friction on temperature follows the same exponential law as the viscosity of liquids. At certain critical temperatures sudden changes apparently occur in the intermolecular forces which cause a transition from one curve to another. The resilience rises linearly with temperature, and shows the same transition points.

There is a wide variation in the properties of stocks made from different polymers. The effect of amplitude of vibration on the modulus and friction is discussed. The modulus and internal friction are affected by temperature in the same way, indicating that there is a dependence of both properties on some fundamental characteristic of the molecular structure.

2:20 P.M.—The Properties of Rubber Solutions and Gels. ***Maurice L. Huggins (Eastman Kodak Co., Rochester).***

By means of a statistical mechanical calculation, Flory and the speaker (independently) have recently derived essentially equivalent expressions for the thermodynamic activities of the components in solutions of long-chain compounds. With the aid of a considerable amount of data from the literature, it is shown that these theoretical results are applicable to rubber solutions. Equations are presented to show the theoretical dependence of the vapor pressure, osmotic pressure, and freezing point lowering on the average chain length, the concentration, and other factors. It is shown graphically that the experimental results are in agreement with these equations.

The theory is shown to be applicable also to rubber gels. Equations are given for the critical conditions for gel formation and for the dependence of the composition of a rubber gel on the nature of the small-molecule component.

The speaker's theory of the viscosity of dilute solutions of kinked chain molecules (such as rubber) is outlined and compared with experiment, especially as regards the dependence of the viscosity on the chain length (molecular weight), the distribution of chain lengths, the nature of the solvent, and the concentration. Some previously anomalous experimental results obtained with benzene solutions are explained. The use of osmotic and viscosity data for molecular weight determination is critically examined and certain fallacies and inaccuracies in the literature on this subject are pointed out.

2:50 P.M.—An X-Ray Study of Chemical Reactions Involving Accelerators in Rubber Compounding, and of Orientation of Crystalline Phases on Stretching of Various Stocks. ***G. L. Clark and R. L. LeTourneau (Noyes Chemical Laboratory, University of Illinois) and J. M. Ball (R. T. Vanderbilt Co., New York, N. Y.).***

Continuing our x-ray diffraction studies of vulcanization and other chemical reactions which may occur in rubber compounding involving vulcanizing agents, accelerators, activators, fillers, and antioxidants, it is now possible to confirm certain reactions which have been suspected, and to detect others previously unknown. The diffraction technique has been perfected in order to detect very small amounts of reaction products when these are in the crystalline state. It is shown conclusively by the x-ray method that tetramethylthiuram disulfide (methyl Tuads) and tetra-methylthiuram monosulfide (Monex) react in the rubber mix during curing to form zinc dimethyl dithiocarbamate (Zimate). The same is true for the ethyl derivatives. The reactions of mercaptobenzothiazole (Captax) and benzothiazyl disulfide (Altax) have also been investigated.

The effects of other activating agents such as litharge, iron oxide, and magnesia have been studied to the end of differentiating the activities of samples of these oxides with various histories. It has been further noted that these zinc salts of accelerators are markedly oriented in the rubber matrix on stretching. This may explain some of the very desirable physical properties of rubber mixes of this type. This test is extended generally to evaluation of bonding of solid particles to rubber.

3:20 P.M.—Intermolecular Forces and Mechanical Behavior of High Polymers. ***H. Mark (Brooklyn Polytechnic Institute, Brooklyn, N. Y.).***

Natural and synthetic high polymers are used with various average degrees of polymerization. It seems that the highest average polymerization degrees, which occur in nature (cellulose, rubber, gutta starch) are around 3000. Synthetic linear high polymers can be prepared without difficulty having similar degrees of polymerization. In some cases, even considerably higher values—up to 10,000—have been observed.

In most cases, one does not use the original material, but degrades it to a certain extent in order to facilitate its commercial manufacturing. A table will be presented, which contains the average polymerization degrees of a series of high polymers as used in rubbers, plastics, and fibers. This table shows that all these three types of high polymers are used in the same average degree of polymerization.

Further studies have shown that also the distribution curves of the materials which are used for the three typical kinds of high polymers are very similar.

The main differences between them are the forces between the chainlike molecules and the tendency with which these substances crystallize under the influence of those forces. Whether a given material appears to us to behave at room temperature as a rubber, a plastic, or a fiber is largely a matter of degree of the readiness to crystallize and to remain in the crystallized state.

If the mutual attraction between the chains is small and (or) their segments do not fit easily in a crystal lattice, the substance is a typical rubber. If, on the other hand, the forces are strong and (or) the chains are readily crystallizable, we shall have a typical fiber. Intermediate cases will show the behavior of a thermoplastic material.

3:50 P.M.—Significance of the Theory of Rubber Elasticity for the Development of Synthetic Rubbers. ***Hubert M. James (Purdue University, Lafayette, Ind.) and Eugene Guth (University of Notre Dame, Notre Dame, Ind.).***

Two cardinal problems exist in connection with the production of synthetic rubbers: (1) choice of the type of syn-

thetics, of the necessary raw materials, and of the methods of preparation to be used; (2) evaluation of the products obtained. The most important property of synthetics (and also of natural rubbers) is their long range reversible elasticity. This is what distinguishes rubber from wax, chewing gum, etc., and makes possible the construction of tires. A theory of this typical rubber elasticity will obviously be of great help in the production, processing, and evaluation of desired synthetics.

Whereas the first semiquantitative theory of rubber elasticity proposed by one of the authors deals with individual molecules united into a coherent mass in some unspecified way, our new theory deals for the first time with a network of flexible chains stretched throughout the mass of rubber. Three separate agents are assumed to act in our model of bulk rubber: (a) an inward pull due to the contracting tendency (because of the intra-molecular Brownian motion) of the network; (b) an outward push due to the outward pressure of a fictitious incompressible "liquid" across which the network of chain molecules extends; (c) an outward pull due to the applied external force.

For the first portion of the stress-strain curve, which even at 10 per cent elongation deviates by 10 per cent from linearity—*i. e.,* from Hooke's law—the agent (b) predominates. For larger extensions (a) predominates. The theory shows, in agreement with experiment, that agents (a) and (b) give rise to a characteristic S-shaped stress-strain curve even in the absence of crystallization phenomena. The existence of a thermoelastic inversion point is connected quantitatively with thermal expansion, thus explaining an effect found more than 80 years ago by Joule. The significance of these theoretical inferences for the development of synthetic rubbers will be discussed.

4:05 P.M.—Stress-Temperature Relations and Creep for Synthetic Rubbers. ***L. E. Peterson, R. L. Anthony, and E. Guth (University of Notre Dame, Notre Dame, Ind.).***

From both the commercial and the theoretical points of view the following two questions are of special importance for synthetics: (1) How closely do synthetics approach natural rubbers in their physical properties? (2) What types of flow phenomena—*i. e.,* creep and relaxation phenomena—are encountered and how do they depend on various factors?

An answer to the first question is of great importance for the processing of synthetic rubbers, and it is also of great theoretical interest in connection with the stress-strain relationship and its dependency upon temperature. With regard to the second point mentioned above, it need merely be pointed out that in practically all applications flow is an undesirable property and a closer study is necessary in order to be able to reduce it. These two aspects have been studied for various synthetics and the following results obtained:

1. All synthetics studied showed the same general features of stress-strain-temperature relationships. In particular, they all possess a thermo-elastic inversion point below which they behave like normal materials and above which they behave like typical rubbers. For each synthetic, the stress was resolved into two components, the predominant part being due to heat motion, and the smaller part being due principally to molecular forces. Comparison with the theory developed by James and Guth shows good agreement. Crystallization did not affect the stress-strain curves in the region of extension studied.

2. The flow phenomena were investigated for the synthetics as functions of stress, strain, temperature, and time. At lower extensions, the flow properties of synthetics were similar to those of natural rubbers. At higher extensions, however, plastic flow was comparatively larger for all synthetics studied than for natural rubbers.

4:20 P.M.—Rise of Temperature on Fast Stretching of Synthetics and Natural Rubbers. ***S. L. Dart, R. L. Anthony, and E. Guth (University of Notre Dame, Notre Dame, Ind.).***

That rubber warms up when stretched rapidly and cools down when released is one of the oldest and best known of the peculiar characteristics of this material. Sensory observation—*i. e.,* stretching rubber rapidly and putting it to the lips, or better, holding it stretched and then letting it retract quickly—shows that the maximum change in temperature should be greater than 10° C. Surprisingly, experiments reported in the literature thus far give only about a third of the expected value. Aside from the fact that an obvious discrepancy exists, this phenomenon is of great interest in tire construction.

Measurements made recently by the authors using a galvanometer constructed to have at the same time exceptionally high speed (about 1/10 second) and high sensitivity (about 10^{-7} ampere per mm.) have yielded results in the expected order of magnitude. Using synthetic rubbers of various types, the rise of temperature was measured as a function of the extension. At lower extensions this rise in temperature, ΔT, is due predominantly to the transformation of mechanical work into heat. At higher extensions heat of crystallization appears for neoprene and natural rubber, but not for the butadiene type synthetics.

Measurements of ΔT on both extension and retraction were made and will be discussed. For competition, several types of natural rubbers were also studied. An undercured latex vulcanizate yielded $\Delta T = 14°$ C., the highest value obtained to date for a pure gum compound.

Friday Morning—September 11

9:00 A.M.—The Statistics of Cross-Linking Reactions in High Polymers. ***T. Alfrey, G. Goldfinger, and H. Mark (Brooklyn Polytechnic Institute, Brooklyn, N. Y.).***

Flory has discussed the nature of the product which results when a high polymer of uniform molecular weight (infinitely sharp distribution curve) is subjected to a cross-linking reaction. The number of unchanged polymer molecules, of pairs, triple molecules, etc., is of course a function of the degree of cross-linking. When a critical degree of cross-linking is exceeded, an infinite network results.

This paper treats the effect of cross-linking on a polymer which already possesses a broad molecular weight distribution curve. The effect of cross-linking on such a polymer is to broaden the distribution curve as well as to increase the average molecular weight. The lowest part of the distribution curve remains relatively unchanged by the cross linking, the middle part is reduced in magnitude, while there is an increase in the amount of very high molecular weight material.

9:15 A.M.—Molecular Weights and Intrinsic Viscosities of Polybutenes. ***Paul J. Flory (Esso Laboratories—Chemical Division, Standard Oil Development Co., Elizabeth, N. J.).***

Viscosity methods provide a most convenient means for characterizing polymeric materials. Frequently the results are expressed as "molecular weights" calculated from Staudinger's equation, according to which the molecular weight is proportional to the intrinsic viscosity

$$[\eta] = [(\ln \eta_r)/c]_{c=0}.$$

Recent work on rubber and various synthetic high polymers has cast serious doubt on Staudinger's method for calculating molecular weights. Unfortunately, satisfactory experimental data for establishing with certainty the correct relationship between molecular weight and solution viscosity are exceedingly meager.

In order to establish this relationship for polybutenes (polymers of isobutylene), samples of narrowly restricted molecular weight range have been prepared by carefully controlled fractional precipitation. The intrinsic viscosities of the fractions have been measured, and their absolute molecular weights have been determined by the osmotic pressure method. Over the entire molecular weight range investigated, from 5,000 to 500,000, the results are in close agreement with an equation of the form $M = K[\eta]_a$ where K is a constant and $a = 1.65$, instead of unity as required by Staudinger's equation.

Houwink has found that results of Staudinger on comparatively heterogeneous polymeric vinyl derivatives can be fitted to a similar relationship, although the molecular weight ranges investigated were limited.

When applied to heterogeneous polymers the above relationship yields a "viscosity average" molecular weight which is intermediate between the weight average and number average molecular weights.

Rubberlike polybutenes possess molecular weights above 500,000, and in some cases they probably reach 5,000,000 or more. Thus, the molecular weights of these synthetic polymers exceed those for soluble crude rubber.

9:35 A.M.—The Action of Organic Accelerators in Buna S. *G. R. Vila (Naugatuck Chemical Division, U. S. Rubber Co., Naugatuck, Conn.).*

No abstract available.

10:05 A.M.—The Effect of Different Carbon Blacks in Synthetic Tire Rubber Compounds. *B. S. Garvey, Jr., and J. A. Freese, Jr. (B. F. Goodrich Co., Akron, Ohio).*

No abstract available.

10:35 A.M.—Discussion of Compounding of Butadiene-Styrene Copolymers.

11:05 A.M.—Perbunan Properties and Compounding. *R. A. Moll, R. M. Howlett, and D. J. Buckley (Esso Laboratories—Chemical Division, Standard Oil Development Co., Elizabeth, N. J.).*

No abstract available.

11:25 A.M.—Butyl Rubber Properties and Compounding. *J. P. Haworth and F. P. Baldwin (Esso Laboratories—Chemical Division, Standard Oil Development Co., Elizabeth, N. J.).*

No abstract available.

Friday Afternoon—September 11

1:30 P.M.—Ebonite from Hycar O. R. *B. S. Garvey, Jr., and D. V. Sarbach (B. F. Goodrich Co., Akron, Ohio).*

No abstract available.

1:50 P.M.—The Evaluation of Small Amounts of Rubbers. *B. S. Garvey, Jr. (B. F. Goodrich Co., Akron, Ohio).*

No abstract available.

2:10 P.M.—The Processing Characteristics of Synthetic Tire Rubber and Their Evaluation. *B. S. Garvey, Jr., M. H. Whitlock, and J. A. Freese, Jr. (B. F. Goodrich Co., Akron, Ohio).*

No abstract available.

2:25 P.M.—Unsaturation of Some Synthetic Rubberlike Materials. *La Verne E. Cheyney and Everett J. Kelley (Goodyear Tire & Rubber Co., Akron, Ohio).*

The unsaturation of three typical synthetic rubberlike materials has been determined by the Wijs method: a sodium butadiene polymer and emulsion copolymers of butadiene-styrene and butadiene-acrylic nitrile.

The experimental method as developed by Kemp and coworkers for natural rubber requires some modifications when applied to the synthetic polymers. A major source of difficulty is the very low solubility of these polymers.

Of a large series of solvents investigated, carbon disulfide seems to function most efficiently for the sodium polymer and the styrene copolymer. Chloroform gives lower results for these two polymers, but was employed as a comparison solvent for the acrylic nitrile copolymer.

The reaction proceeds much more slowly than with natural rubber, 24 hours at 30° C. being required to complete the addition reaction. After this, cyclization occurs in the copolymers and substitution in the butadiene polymer.

None of the iodine values reached the theoretical values for straight linear polymers. This difference, which is least in the butadiene-styrene copolymer, is attributed to cyclization or cross-linking. As indicated by the iodine values in carbon disulfide, there is about 4 per cent of cross-linkage in the styrene copolymer and about 10 per cent in the sodium polymer.

2:40 P.M.—Thermal Decomposition of Natural and Synthetic Rubber Stocks. *Irven B. Prettyman (Firestone Tire & Rubber Co., Akron, Ohio).*

From a thermal viewpoint, the ability of a natural or synthetic rubber stock to withstand service conditions is dependent on the rate of heat generation as governed by the modulus and internal friction, the rate of heat dissipation as governed by thermal conductivity, and the effect of temperature on the chemical structure. Little work has been published on this latter factor. One indication of this chemical degeneration is the development of porosity in the stock.

A laboratory method for determining the decomposition temperature, as evidenced by the formation of blowholes in cube samples immersed in liquid metal, is described. Decomposition temperature results are given of the cumulative addition of zinc oxide, accelerator, and softener to a rubber-sulfur stock. A comparison of various accelerators in tread, carcass, and gum rubber stocks is made. The effect of variation in the sulfur and black content of rubber stocks is shown. Rubber stocks containing zinc oxide, channel black, P-33 black, clay, and Calcene are compared. A comparison of Hevea rubber, reclaim rubber, guayule, Buna S, Buna N, and Neoprene GN in gum and in channel black stocks is made.

In each comparison made, definite and sometimes large differences in the decomposition temperature were found. In particular, stocks containing Captax and Santocure were found to have a higher decomposition temperature than those containing guanidine and A-32. An increase in the sulfur content of tread stock from 2.5 to 3.5 parts on 100 parts of rubber decreased the decomposition temperature. P-33 black, followed by clay, was found superior in the pigment series. Buna S, Buna N, and Neoprene GN stocks were found to have much higher decomposition temperatures than natural rubber. The desirability of measuring the decomposition temperature of natural and synthetic rubber stocks in the light of service conditions is indicated.

2:55 P.M.—Density Measurements on Synthetic Rubbers. *Lawrence A. Wood, Norman Bekkedahl, and Frank L. Roth (National Bureau of Standards, Washington, D. C.).*

A method has been developed for preparing specimens of synthetic rubber in a form suitable for precise measurements of the density. The rubber is outgassed in a vacuum mold and while still under vacuum is compressed to a sheet about 1/16 inch thick. Specimens weighing about 1 gram each are cut from this sheet and are employed for the measurement of the density by the method of hydrostatic weighings. The values obtained with different specimens from the same sample rarely differ from each other by more than 0.05 per cent. Measurements are made soon after molding because some rubbers tend to recover and develop roughened surfaces and vacuoles which bring about a decrease in the apparent density.

Unvulcanized Buna S prepared in a laboratory polymerization with a minimum quantity of materials other than butadiene and styrene was found to have a density at 25° C. of 0.9291 gram per cc. Corresponding values for Buna S produced on a commercial scale by three different manufacturers were 0.9358, 0.9369, and 0.9390 gram per cc., respectively. Similar measurements with Butyl rubber, Type B, gave a value of 0.9175 gram per cc. at 25° C. The densities of other common varieties of synthetic rubber have been measured.

3:10 P.M.—Low-Temperature Testing of Rubber: Influence of Variable Stress on Brittle Point. *G. G. Winspear, F. S. Malm, and A. R. Kemp (Bell Telephone Laboratories, New York, N. Y.).*

No abstract available.

3:25 P.M.—Effect of Aniline Points of Oil on Swelling of Synthetic Rubbers. *A. C. Hanson (Rock Island Arsenal, Rock Island, Ill.).*

The swelling of neoprene, Butyl, and Perbunan was determined at room temperature and at 70° C. in oil with aniline points varying from 42° to 130° C. The maximum points were used in this investigation rather than the cloud temperature of the mixture of equal volumes of oil and aniline. Volume determinations were made after 1, 3, 4, 5, 11, 26, 65, and 130 days. Logarithm of the percentage change in volume was then plotted against the aniline number.

In the papers on "Swelling of Synthetic Rubbers in Mineral Oils" by Carmen, Powers, and Robinson [*Ind. Eng. Chem.*, Vol. 32, P. 1069 (1940)] and by Powers and Robinson [*Ind. Eng. Chem.*, Vol. 34, P. 614 (1942)] no values for mineral oil below an aniline point of 60° C. were plotted. A straight line was, therefore, obtained and it was stated that swelling varied inversely with the aniline point.

In the present investigation, the logarithms of the per cent change in volume of the synthetics tested varied inversely with the aniline point of paraffin-base oils. Oils with a higher percentage of aromatic, however, caused a greater swelling than would be predicted by the above generalization. It is, therefore, concluded that a straight-line relationship does not exist between the logarithms of the per cent increase in volume and aniline points.

3:40 P.M.—Effect of Petroleum Products on Neoprene Vulcanizates. III. Effect of Kerosenes. *Donald F. Fraser (E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.).*

The use of the aniline point has been advocated as a means of predicting the swelling power of lubricating and hydraulic oils on synthetic rubber vulcanizates. This scheme allows a means of describing constant swelling effect oils for specification purposes and has been used to this end. With kerosenes and kerosene-benzol blends the aniline point does not predict the swelling power. However, the Diesel index, a simple constant involving aniline point and gravity, may be used for this purpose. This allows the replacement of kerosene-benzol blends by constant swelling effect kerosenes which will permit the use of higher test temperatures and will eliminate the necessity of reflux condensers during immersion tests.

3:55 P.M.—Factors Influencing the Volume Change of Hycar O. R. Compounds in Oil. *A. E. Juve and B. S. Garvey, Jr. (B. F. Goodrich Co., Akron, Ohio).*

The volume change of a series of Hycar O. R. compounds over a period of 28 days has been investigated in relation to: (1) the temperature of immersion, (2) the type of oil, (3) the type of softener in the compound, and (4) the size and shape of the test specimen. Oils with low aniline points cause greater swelling than those with high aniline points. At higher temperatures the change in volume is both faster and greater than at lower temperatures. The type of softener used in the compound has a marked effect on the change in volume. Not only the rate of change of volume but also the total change may be markedly affected by the size and shape of the test specimen.

These results show that the factors influencing volume change are complex. The usual laboratory immersion tests give only approximations to the results to be expected in service. Where close tolerance is important it is necessary to test the finished article under conditions similar to those of actual service.

Disadvantages of Synthetic Rubber

IT is well known that the use of some of the synthetic rubbers present processing difficulties which time alone will solve, although considerable advances have been made to date. Therefore, the following abstract on these difficulties, taken from the April, 1942, issue of the *Industrial Bulletin of Arthur D. Little, Inc.*, should prove of interest:

Most of the large rubber companies have been working with synthetics for the past few years, often more with a view to supplementing the properties of natural rubber for special services than with the present crisis in mind, and have already acquired much valuable information on the properties and processing of the new types. It has been found that synthetics in general are not as workable in the plant as is rubber, and most require liberal additions of chemicals to make them usable. These chemicals, in turn, are often of limited availability and some are wanted for other uses. Being non-rubber, they dilute the rubberiness of the whole composition.

Synthetics tend to be difficult to work on rolls and in the forming and curing operations call for extra power and labor, as well as reduce plant capacity by the need of additional mixing equipment. More familiarity must be gained before these processing disadvantages can be overcome.

For the 60 to 65 per cent of rubber in a tire tread, a composition is needed that has high modulus, the quality of strong resistance to deformation. High modulus is one of the factors giving resistance to wear and ability to absorb shock. Other qualities are also needed to conform to roughness of surface without undue abrasion.

For tread use, some of the synthetics are satisfactory, but reclaim is less well adapted. The tread has to be bound to the carcass of the tire, and for most methods of construction an intermediate or binder strip may have to be used, rich in natural rubber, which possesses the extremely good adhesive properties that are short in most synthetics.

For the carcass stock, which must adhere well to the fabric and stand flexing without getting too hot, a considerable percentage of reclaim may be used, strengthened by a moderate proportion of natural rubber. For inner tubes, the requirements are high elasticity, imperviousness to air, resistance to heat, and resistance to tear. Experience with synthetics in inner tubes is apparently still limited.

For tank treads backed by metal, mixtures of reclaim and synthetic rubbers should be excellent. For airplane fuel tanks, the inner lining must be made of gasoline-resistant synthetic and the self-sealing layer must to date be made of raw natural rubber. For each service, particular ingredients serve best. Ultimately, economic considerations as well as specific utility may determine the kinds of rubbers to be used for each specific service.

Rubber is possibly destined to join the long list of natural materials replaceable by synthetics, starting with indigo and now including camphor, vitamins, rayons and drugs. We have yet to acquire the art of economically manufacturing tires from synthetics within the facilities of existing industry without the use of a substantial percentage of natural rubber.

Amendments to Order No. M-15-b-1

Amendment No. 7

Section 940.5 (Supplementary Order No. M-15-b-1) is hereby amended as follows:

1. By inserting the following new subparagraph immediately after subparagraph (b) (16) thereof:

(17) Airplane Tires. List 17.

2. By attaching thereto the attached additional list designated List 17.

This Order shall take effect as of the date of its issuance.

Issued this 1st day of July, 1942.

J. S. KNOWLSON,
Director of Industry Operations

List 17—*Specifications for the manufacture of airplane tires.*

(a) The following specifications shall be followed in the manufacture of airplane tires to fill all purchase orders, including War Orders and orders placed by or for the account of any other department or agency of the Government of the United States.

(b) Compounds used in the manufacture of airplane tire casings shall be prepared in accordance with the specifications set forth in subdivision (a) of List 7, as amended from time to time, attached to Supplementary Order No. M-15-b-1.

(c) Airplane tire casings shall be made only in the sizes hereinafter listed:

(d) The friction and the tread, respectively, of each of the classes of airplane tire casings listed below shall be made from one of the grades of compounds listed in subdivision (a) of said List 7, the appropriate grade of compound to be used for each such respective friction or tread being that hereinbelow specified therefor opposite the description or designation of such class.

Description of product		*Compounds to be used*	
Size	*Ply*	*Truck Friction*	*Tread*
Smooth Contour Landing Wheels			
27	8	B	B
30	8	B	B
33	8	B	B
36	10	B	B
39	10	B	B
44	10	A	A
47	12	A	A
51	14	A	A
56	16	A	A
65	16	A	A
Auxiliary Wheels			
8.00	4	B	B
10.00	6	B	B
12.50	6	B	B
14.50	6	B	B
17.00	6	B	B
19.00	6	B	B
23.00	8	B	B
26.00	10	A	B
30.00	10	A	B
High Pressure Landing Wheels			
26x6-14	8	A	B
30x5-20	4*	C	C
30x7-16	8	A	B
32x6-20	4*	C	C
32x8-16	8	A	B
36x8-20	6*	C	C
34x9-16	10	A	B
36x10-16	10	A	A
38x10-18	12	A	A
40x10-20	8*	C	C
Auxiliary Wheels			
10½-4	6	B	B
12½-4½	8	B	B
10x3-4	4*	C	B
Low Pressure Landing Wheels			
20x7.00-6	4	C	B
22x6.50-10	6	C	B
24x7.50-10	6	C	B
26x8.50-10	6	B	B
39x13.50-16	10	B	B
42x15.00-16	10	B	B
42x15.00-16	8†	B	A
44x16.00-16	10	B	B
45x17.00-16	10	B	B
45x17.00-16	10†	B	A
45x18.00-16	12	B	B
45x20.00-18	12	B	B
46x15.50-20	12	B	B
50x17.00-20	12	A	A
55x19.00-23	16	A	A
Auxiliary Wheels			
13x5.00-4	6	B	B
17x6.00-6	4	C	B
16x7.00-4	4	C	B
17x7.00-5	4	C	B
17½x8.00-4	4	C	B
19x8.00-5	6	C	B
19x8.00-5	4 H.D.	C	B
22x9.00-6	8	B	B
24x10.00-7	10	B	A
29x9.50-12	6‡	B	B
32x11.00-12	8	C	C
36x12.50-14	10‡	B	B
Extra Low Pressure Landing Wheels			
25x11-4		B	B
29x13-5		B	B
30x13-6		B	B
35x15-6		B	B
45x20-10		B	A
Auxiliary Wheels			
12x5-3	4	B	B
16x7-3	4	B	B
18x8-3	4	B	B
Streamline Landing Wheels*			
24	4	C	B
27	6	B	B
31	6	C	C
36	6	C	C
40	8	C	C
45	8	C	C
50	8	C	C
27.50x8.90-12.50	4	C	B

Description of product		*Compounds to be used*	
Size	*Ply*	*Truck Friction*	*Tread*
Low Profile Auxiliary Wheels			
19x6.80-10	6	B	B
22x7.25-11.50	6	B	B
26x9.00-13.00	8	B	B
33x11.50-16.50	10	B	B
Cushion Auxiliary Tires			
6x2.00	—	—	A
8x2.50	—	—	A
Solid Auxiliary Tires			
6x2½	—	—	A
6x3½*	—	—	A
8½x4	—	—	A
10x3*	—	—	A
10x4*	—	—	A

* Inactive for new design. ‡ Beaching gear tires only.
† Air line use only.

Amendment No. 8

Section 940.5 *(Supplementary Order M-15-b-1)* is hereby amended by substituting the attached list designated List 12 for List 12 now attached thereto.

This order shall take effect as of the date of its issuance.

Issued this 10th day of July, 1942.

J. S. KNOWLSON, *Director of Industry Operations*

List 12 (Revised effective July 10, 1942). *Specifications for the manufacture of insulated wire and cable.*

No person shall consume Rubber, Latex or Reclaimed or Scrap Rubber in the manufacture of insulated wire and cable enumerated below in subdivision (b) except in accordance with the specifications herein prescribed unless expressly exempted in paragraph (1) of subdivision (b) hereof.

Compounds and constructions specified herein in subdivisions (a) and (b) for insulated wire and cable shall be used to fill all orders, including War Orders and orders placed by any department or agency of the United States Government, except as expressly exempted in paragraph (1) of subdivision (b) hereof.

(a) *Compounds*

Use	Compound grade	Maximum percent by volume		Performance reference
		Crude rubber	Total RHC	
(1) Insulation.	W-A	55	65	Performance Type RP or ASTM-D-353-1941.
	W-B	35	50	{ASTM-EA-D-353. {ASTM-EA-D-574.
	W-C	13	55	N.E.C. grade—2/11/42.
(2) Jackets.	W-D	50	75	ASTM-EA-D-532.

(i) The total rubber hydrocarbon (RHC) is the sum total of the crude rubber and the rubber value of the reclaimed rubber expressed on a volume basis.

(ii) If the per cent by volume of crude rubber is reduced below the maximum specified, it is permissible to substitute an equivalent amount of rubber hydrocarbon (RHC) in the form of reclaimed rubber, but in no case shall the specified maximum percentage of total rubber hydrocarbon (RHC) be exceeded.

(iii) The performance references are given for the purpose of guidance as to performance expectation and represent typical compounds, but they do not form a part of this Order.

(b) *Insulated Wire and Cable.*

(1) *Exceptions.* The specifications hereinafter set forth need not be followed in the manufacture of insulated wire and cable of the following types:

(i) Submarine cable designed for communications, light and power.

(ii) Oil and gas well logging cable.

(iii) Military field communication wire, search light and fire control cable and Radar Detector Cable.

(iv) Cord and cable designed for naval shipboard use, aviation use or for use on guns or other weapons.

(v) Rubber compound tape designed for splicing and terminal use with products listed in (i), (ii), (iii) and (iv) above.

(vi) Any other type of insulated wire and cable, provided the purchase order is accompanied by a certificate signed by a contracting or inspecting official of the Army, Navy, Maritime Commission or other governmental agency listed in subparagraphs (a) (4) (i) (aa) or (a) (4) (ii) of Supplementary Order No. M-15-b, as amended, certifying that the use of compounds specified by this Order is inadequate and that the use of the compounds specified by the purchase order is necessary for direct military or naval use.

(2) *Wire and cable.* Insulations and jackets of each of the classes of wire and cable listed below shall be made from one

Type of service	Outer covering	Operating Voltage	Compounds for— Insulation	Jacket
(i) Building wire telephone drop wire, Police and Fire alarm Systems, and general service designed for use in dry locations.	Fibrous or lead	0-3000	W-C	None
	Lead	3001-5000	W-C	None
	Fibrous	3001-5000	W-B	None
	Fibrous or lead	5001 and over	W-B	None
(ii) For general service designed for use in wet locations.	Lead or impervious sheath	0-3000	W-C	None
	Lead or impervious sheath	3001 and over	W-B	None
	Fibrous [1]	All Voltages	W-A	None
(iii) For special service wire and cable designed for: (aa) Copper temperatures above 60° C. (bb) Motor leads. (cc) Severe mechanical conditions. (dd) High frequency communications. (ee) Railway signal service.	Fibrous or lead	0-600	W-A	None
	Fibrous, lead or impervious sheath	All voltages	W-A	None
(iv) Designed for portable Heavy Duty Service of the following kinds only: (aa) Electric power shovels and dredges. *(bb) Mining locomotives and machinery. *(cc) Welding machinery and power leads. (dd) Portable drills and tools. (ee) Electrically driven construction machinery, including air compressors, cement mixers, conveyors, hoists, cranes, locomotives and public conveyances. (ff) Oil well exploration cable. (gg) Shot fire cable, for use in gaseous mines as required by the U. S. Bureau of Mines.	.....	0-5000	W-B	W-D
(v) Portable appliance service cords.....	Fibrous [2]	0-600	W-C	None
(vi) Automotive ignition cable	Fibrous	All voltages	W-B	None

[1] Except that W-B compound may be used in the insulation of lead covered underground distributing telephone cables. [2] Provided that a compound containing not more than 50% by volume of rubber hydrocarbon (RHC) obtained by the use of reclaimed rubber only, may be used as a jacket in the manufacture of PWP type cord. * For "Uni-insulation" the use of (W-A) compound is permitted in (iv) (bb) and (iv) (cc).

of the grades of compounds listed in subdivision (a) of this specification, the appropriate grade of compound to be used for insulation or jacket being that hereinbelow specified opposite the description or designation of such class.

(3) *Cable tape.* Compounds for manufacturing cable tape shall contain no crude rubber and not more than 30% by volume of rubber hydrocarbon (RHC) obtained by use of reclaimed rubber, and shall be applied only to one face.

(4) *Grounded neutral conductor.* No rubber, latex, reclaimed or scrap rubber shall be used as insulation on wire designed for the grounded neutral conductor, known as the "identified" or "white" wire of a O-600 V A-C wiring system, including the service drop and service, the mains, feeders and branch circuit conductors up to the final outlet, but not including portable heavy duty or portable appliance service cords listed in subparagraphs (2) (iv) and (2) (v) above, nor the wires designed for lighting fixtures.

(5) *Jackets, belts and sheaths.* Rubber jackets, belts or sheaths shall not be used for mechanical protection in wire or cable except as provided in subparagraphs (2) (iv) and (2) (v) above.

(6) *Walls.* No insulated wire shall be manufactured or specified by any person with heavier walls than those provided by American Standards Association's standard; and required by the rating of the equipment serviced, except for non-leaded submarine cable.

(7) *Splicing tape and terminals.* Rubber compounds for splicing tape and terminals shall conform to specifications set forth in List 16 attached to Order M-15-b-1, except that compounds designed for tape for the following uses may be manufactured in the same quality as the insulation specified:

(i) For operating voltages in excess of 3000 volts.

(ii) For cables to be used in wet locations.

(iii) For operation at conductor temperatures of 70°C. or higher.

Amendment No. 9

Section 940.5 (*Supplementary Order M-15-b-1*) is amended as follows:

1. By changing subparagraph (b) (1) to read as follows:

LIST 1

(1) Mechanical goods of the following types: Belting; Hose; Packing; Dam and lock gate seals; Hog scraper (beater) paddles; Loom pickers; Milk and milking machine equipment; Pipe coupling rings; Press die pads; Printing rubber products; Rubber-lined tanks, drums and rubber-protected industrial equipment; Abrasive implements; Mine and industry safety parts.

(2) By changing paragraph (b) (2) and (b) (10) to read as follows:

(2) Superseded by Revised List 1.
(10) Superseded by Revised List 1.

(3) By attaching thereto the attached List designated "List 1—(Revised effective July 21, 1942)."

This Order shall take effect as of the date of its issuance.

Issued this 21st day of July, 1942.

AMORY HOUGHTON,
Director General for Operations

LIST 1 (Revised effective July 21, 1942). *Specifications for the manufacture of the following mechanical goods:*

Belting; Hose; Packing; Dam and lock gate seals; Hog scraper (beater) paddles; Loom pickers; Milk and milking machine equipment; Pipe coupling rings; Press die pads; Printing rubber products; Rubber-lined tanks, drums and rubber-protected industrial equipment; Abrasive implements; Mine and industry safety parts.

(a) *Revocation of certain specifications.* The specifications set forth in the following lists attached to Supplementary Order No. M-15-b-1, as such lists and specifications exist as of the effective date of this revised List 1, are superseded by the specifications set forth in this revised List 1: Hose and tubing of the kinds listed, List 1; conveyor, elevator, and flat transmission belts and belting of the kinds listed, List 2; and fire hose and mill hose, List 10.

(b) *Restrictions on the use of rubber, latex, synthetic rubber, reclaimed or scrap rubber.* No person shall consume rubber, latex, synthetic rubber or reclaimed or scrap rubber in the manufacture of any of the items enumerated below except in accordance with the specifications herein prescribed, or except in the case of any War Order in connection with which there is delivered to the person manufacturing such product, a certificate signed by a contracting or inspecting official of the Army, Navy, Maritime Commission or other proper governmental agency, certifying that the use of compounds or constructions not permitted by these specifications is necessary for military or naval use, or for use on board ship.

Except as provided in the preceding paragraph, the specifications herein prescribed shall be used to fill all orders, including War Orders and orders placed by any other department or agency of the United States Government.

(c) *Specifications.*

I. Compounds

A. RUBBER COMPOUNDS

Grade	Maximum percent by volume: Crude rubber	Total R. H. C.	Grade	Maximum percent by volume: Crude rubber	Total R. H. C.
M-A	95	95	M-O	30	65
M-B	90	90	M-P	25	65
M-C	85	85	M-P-1	25	60
M-D	80	80	M-P-2	25	25
M-E	75	75	M-Q	20	70
M-F	70	70	M-Q-1	20	60
M-G	65	75	M-Q-2	20	45
M-G-1	65	65	M-Q-3	20	25
M-H	60	75	M-R	15	60
M-H-1	60	60	M-R-1	15	55
M-H-2	60	80	M-R-2	15	20
M-J	55	75	M-R-3	15	15
M-J-1	55	55	M-S	10	60
M-K	50	70	M-S-1	10	15
M-K-1	50	50	M-S-2	8	11
M-L	45	65	M-S-3	6	16
M-L-1	45	45	M-S-4	4	9
M-M	40	65	M-S-5	3	8
M-M-1	40	60	M-S-6	2	15
M-M-2	40	40			
M-N	35	65	M-T	0	50
M-N-1	35	50	M-T-1	0	6

B. SYNTHETIC RUBBER COMPOUNDS

Grades: Butadiene	Grades: Chloroprene	Maximum percent by volume: Polysulfide	Total S. R. V.
M-SB	M-SN	M-ST	95
M-SB-1	M-SN-1	M-ST-1	90
M-SB-2	M-SN-2	M-ST-2	85
M-SB-3	M-SN-3	M-ST-3	80
M-SB-4	M-SN-4	M-ST-4	75
M-SB-5	M-SN-5	M-ST-5	70
M-SB-6	M-SN-6	M-ST-6	65
M-SB-7	M-SN-7	M-ST-7	60
M-SB-8	M-SN-8	M-ST-8	55
M-SB-9	M-SN-9	M-ST-9	50
M-SB-10	M-SN-10	M-ST-10	45
M-SB-11	M-SN-11	M-ST-11	40
M-SB-12	M-SN-12	M-ST-12	35
M-SB-13	M-SN-13	M-ST-13	30
M-SB-14	M-SN-14	M-ST-14	25

NOTE 1: The rubber hydrocarbon (R. H. C.) is the sum total of crude rubber and the average rubber value of reclaim expressed on a volume basis. NOTE 2: The synthetic rubber value (S. R. V.) is the total synthetic rubber expressed on a volume basis. NOTE 3: Where rubber or reclaim is mixed with synthetic compounds or where a mixture of synthetics is used, the R. H. C. volume plus the S. R. V. volume shall not exceed the maximum S. R. V. by volume of the grade specified. NOTE 4: In those products listed for rubber grades only, synthetic rubbers may be used as they become available, provided the maximum S. R. V. by volume does not exceed the maximum R. H. C. listed for the specific grade. NOTE 5: Compounds of lower rubber and rubber hydrocarbon (R. H. C.) content may be used in manufacturing mechanical rubber products listed herewith, provided the physical requirements, where specified, are met. NOTE 6: All compounds shall be black unless otherwise specified.

II. *Belting specifications*

NOTE: The following specifications for conveyor, elevator and transmission belting appearing in subdivisions II-A, II-B and II-C hereof, do not apply to rubber belting utilizing a solid woven carcass, provided such construction uses no more crude rubber or reclaimed rubber hydrocarbon than is permitted in laminated belting of equivalent size and thickness; nor do they apply to constructions using combinations of fabric and other reinforcing materials, provided total rubber and rubber hydrocarbon do not exceed those which are used in an equivalent grade, fabric ply, construction belt.

A. *Conveyor belting*

1. *Compounds permitted.* Compounds for each of the grades of conveyor belting listed in Table A below shall be made from one of the grades of compounds listed in subdivision (c)-I-A of this revised List 1, the appropriate grade of compounds to be used for covers and frictions being that hereinbelow specified therefor opposite the description or designations of such class in Table A.

TABLE A

Grade of belt	Conveyor cover compound	Pulley cover compound	Friction compound	Grade specification: Average tensile range P.S.I. Pulley cover	Grade specification: Average tensile range P.S.I. Conveyor cover	Average friction range in pounds	Combined cover gauge maximum in inches
No. 1	M-N	M-R	M-N	800-1,000	1,700-2,200	16-19	7/32
No. 2	M-R	M-R	M-P	800-1,000	800-1,000	12-15	7/32

NOTE 1: A skim coat of same quality as friction and not exceeding .010 shall be permitted on 42 oz. or heavier belt duck on Grade 1 only. NOTE 2: Breaker may be used on Grade 1 only and where used is to be included in cover thickness. NOTE 3: All friction and covers to be black only.

2. *Grades of belts permitted.* (i) All belts designed for the following uses shall be of Grade 2 quality only, and the thicknesses for each group shall not exceed those specified for such group:

Group 1. Sum of thicknesses of conveyor and pulley covers shall not exceed 1/16": Fruits; Vegetables; Lime slacked; Charcoal; Grains and seeds; Beets; Flour; Soap; Portable conveyor for handling above material.

Group 2. Sum of thicknesses of conveyor and pulley covers shall not exceed 3/32": Sand; Soil; Soda; Powdered stone and chemicals; Earth; Fine gravels to ½"; Pulverized coal; Coke breeze; Concentrates; Wet pulp; Portable conveyor for handling above material.

Group 3. Sum of thicknesses of conveyor and pulley covers shall not exceed ⅛": Sulphur; Salts; Sugar; Small size bituminous coal up to 4"; Small coke up to 2"; Ashes; Culm; Clay; Shells; Gravel ½" to 2"; Concrete mix; Cement; Lime unslacked; Phosphate pebble; All portable conveyors except for services in Groups 1 and 2.

(ii) Either Grade 1 or Grade 2 belting may be used for belts designed for services other than specified in Groups 1, 2 and 3 above.

(iii) Conveyor belting designed for the handling of boxes, bales, bags, cases, sacks, paper, dry pulp and wood chips shall not be made in whole or in part of rubber, latex, reclaimed or scrap rubber or synthetic rubber.

B. *Elevator belting*

1. *Compounds permitted.* Compounds for each of the grades of elevator belting listed in Table B below shall be made from one of the grades of compounds listed in subdivision (c)-I-A of this specification, the appropriate grade of compounds to be used for covers and frictions being that hereinbelow specified therefor opposite the description or designation of such class in Table B.

TABLE B

Grade of belt	Pulley cover compound	Bucket cover compound	Friction compound	Grade specification: Average tensile range P.S.I. Bucket cover	Grade specification: Average tensile range P.S.I. Pulley cover	Average friction range in pounds	Maximum combined cover gauge in inches
No. 1	M-N	M-R	M-N	800-1,000	1,700-2,200	16-19	3/16
No. 2	M-R	M-R	M-P	800-1,000	800-1,000	12-15	3/16

NOTE 1: A skim coat of same quality as friction and not exceeding .010 shall be permitted only on Grade 1. NOTE 2: Breaker fabric may be used on Grade 1 only. When used it must be included in the cover thickness. NOTE 3: All frictions and covers shall be black only.

2. *Grades of belts permitted.* (i) All belts designed for the following uses shall be of Grade 2 quality only, and the thicknesses for each group shall not exceed those specified for such group:

Group 1. Sum of thicknesses of the bucket and pulley covers shall not exceed 1/16": Pulverized coal; Soap; Lime slacked.

Group 2. Sum of thicknesses of the bucket and pulley covers shall not exceed ⅛": Coke breeze; Powdered stone and chemicals; Concentrates; Sand; Clay; Soil.

Group 3. Sum of thicknesses of the bucket and pulley covers shall not exceed 5/32": Gravel up to 2"; Small bituminous coal up to 2"; Trap rock up to 2"; Salt; Sugar; Cement; Lime unslacked.

Group 4. Friction surface only: Grains; Seeds.

(ii) Either Grade 1 or Grade 2 belting may be used for belts designed for services other than specified in Groups 1, 2, 3 and 4 above.

(iii) Elevator belting designed for the handling of boxes, bales, cases, sacks, paper, dry pulp and wood chips shall not be made in whole or in part of rubber, latex, reclaimed rubber, scrap rubber or synthetic rubber.

C. *Flat transmission belting*

Flat transmission belts and belting shall be manufactured in two grades only, as follows:

Grade of belt	Crude rubber maximum by weight in pounds	Total R. H. C. maximum by weight in pounds
No. 1	.46	.73
No. 2	.15	.47

NOTE 1: The maximum crude rubber and total R. H. C. by weight as specified above shall be based on a unit of 1,200 sq. in. per single ply of fabric. NOTE 2: All flat belts and belting designed to transmit power to any farm machinery and equipment shall be Grade 2 quality, except those designed to transmit power to Hammermills which may be Grade 1. NOTE 3: Grade 1 belting is permitted with ⅛" Grade M-N rubber cover when designed for service under severe chemical conditions. No rubber covers are permitted for belts designed for any other service. NOTE 4: All compounds except seaming rubber shall be black only. NOTE 5: No rubber or reclaim shall be used in the manufacture of loom harness strapping.

D. *Vee belts*

1. Vee belts shall be manufactured in two grades only, as follows:

Grade of belt	Crude rubber maximum by volume of total belt	Total R. H. C. maximum by volume of total belt
	Percent	Percent
No. 1	40	55
No. 2	1	50

NOTE 1: The crude rubber and R. H. C. is based on total volume of belt. In determining the belt volume the published nominal cross-sectional dimensions shall be used where these exist and mold cross-sectional dimensions shall be used in all other cases. The percentage calculations shall be based on the volume of net finished belt but manufacturing waste shall be included in the crude rubber and R. H. C. contents.
NOTE 2: All compounds shall be black only except cord treatments.

2. All belts of the following classifications shall be of Grade 2 quality only: F. H. P.; Belts designed for replacement for passenger automobiles; Belts designed for replacement for trucks under 1½ tons; Agricultural belts except those of C section and larger, double Vee and round belts of any section, designed for use for agricultural machinery. Farm tractor belts not included; Household equipment belts.

III. *Hose specifications*

The tube, friction, layers, fillers and covers for each of the following types of hose shall be made from one of the grades of compounds listed in subdivision (c)-I-A or (c)-I-B of this revised List 1, the appropriate grade of compound to be used being that hereinbelow specified therefor opposite description or designation of such type.

Hose furnished to these specifications for hose shall be inspected and tested in accordance with A. S. T. M. Method D-380, latest revision.

A. COMMERCIAL TYPES

Type of product	Compound: Tube	Compound: Friction	Compound: Layer or Filler	Compound: Cover	Construction and/or service restrictions
Acid-Conducting and suction...	M-H	M-P	M-R	M-P	Tube: $\frac{1}{8}$ inch maximum. Cover: $\frac{1}{16}$ inch maximum.
Air brake: Truck and busses...	M-N	M-N	....	M-P	Maximum wall: $\frac{33}{64}$" on sizes under $\frac{5}{16}$" I. D. $\frac{1}{16}$" on sizes $\frac{5}{16}$" and over
Air-Curb	M-T	M-T	....	M-T	Maximum wall: $\frac{1}{16}$ inch. Made only in ¼" and $\frac{5}{16}$" I. D. sizes.
Air and air tool: Industrial, grade 1.....	M-N	M-P	....	M-M	Maximum wall: $\frac{11}{32}$" for sizes with $\frac{3}{16}$" I. D. and smaller. $\frac{13}{32}$" for sizes ¼" I. D. to 1½" I. D., inclusive. ½" for sizes $1\frac{5}{16}$" I. D. to 3", inclusive. $\frac{5}{16}$" for sizes over 3" I. D. Service: Designed for use only for heavy duty service, in mines, quarries and outside construction, including shipyards where tools are oiled through the hose and abrasion on cover is severe.
Grade 2	M-Q-1	M-P	....	M-P	Maximum wall: $\frac{3}{32}$" for sizes $\frac{5}{16}$" I. D. or smaller. $\frac{11}{32}$" for sizes ¼" I. D. to 1½", incl. $\frac{7}{16}$" for sizes over 1½" I. D. Service: Designed for use for all industrial air or air tool service not specifically covered in Grade 1.
Braided cover tubing.....	M-T	....	....	....	Maximum wall: $\frac{5}{64}$" on sizes $\frac{3}{16}$" I. D. and under. $\frac{3}{32}$" on sizes over $\frac{3}{16}$" I. D.
Butane and propane.....	M-SB-9 or M-SN-9 or M-ST-6	M-SB-8 or M-SN-8 or M-ST-6	....	M-SB-8 or M-SN-8 or M-ST-6	Maximum wall: $\frac{1}{16}$" on sizes 1" I. D. and under. $\frac{33}{64}$" on sizes over 1" I. D.
Cable covering—Electric	M-T	M-T	....	M-T	Maximum wall: $\frac{3}{32}$".
Car heater	M-T	M-T	....	M-T	Maximum wall: $\frac{11}{64}$".
Cement handling Cement gun, incl. grouting.	M-E	M-H	M-P	M-P	Tube: $\frac{1}{16}$" maximum. Cover: $\frac{1}{16}$" maximum.
Cement & material—dry.....	M-E	M-N	M-P	M-P	Tube: $\frac{1}{16}$" maximum for sizes 1" I. D. and under. ¾" maximum for sizes over 1" I. D. Cover: $\frac{9}{64}$" maximum all sizes. Not permitted for rock wool insulation.
Concrete placing	M-E	M-N	M-P	M-P	Tube: ½" maximum. Cover: $\frac{1}{16}$" maximum.
Chemical	M-T	M-R	....	M-T	Maximum wall: $\frac{3}{32}$" on sizes ¾" I. D. and under. $\frac{11}{32}$" on sizes over ¾" I. D.
Coupling: Flexible	M-Q-1	M-R	....	....	Tube: $\frac{1}{64}$" maximum.
Creamery (sanitary)	M-Q-1	M-M	....	M-N	Tube: $\frac{1}{64}$" maximum. Cover: $\frac{1}{16}$" maximum. Service: For meat packing or food handling plants only.
Divers:					
Floating	M-A	M-H	....	M-A	Maximum wall: $\frac{1}{16}$".
Sinking	M-N	M-N	....	M-M	Maximum wall: $\frac{1}{16}$".
Dredging sleeves	M-H	M-N	....	M-P	Tube: ¼" maximum. Cover: $\frac{9}{64}$" maximum. Skim coat: Not permitted.
Expansion joints	M-A	M-E	M-M	M-M	Tube: $\frac{1}{8}$" maximum for sizes 8" I. D. and under. $\frac{3}{16}$" maximum for sizes over 8" I. D. Cover: $\frac{1}{16}$" maximum all sizes. Service: Expansion joints are normally used in rigid line to absorb thrust or excessive motion or to isolate vibration and/or noise.
Fire extinguisher tubing.....	M-T	M-T	....	M-T	Maximum wall: $\frac{1}{16}$".
Flanged flexible pipe.....	M-E	M-N	M-P	M-P	Tube: $\frac{1}{16}$" maximum for sizes 12" I. D. and under. ¼" maximum sizes over 12". Cover: $\frac{3}{64}$" maximum all sizes.
Fuel line, automotive, truck and bus.	M-K or M-SB-10 or M-SN-10	....	....	....	Service: Rubber shall be used only in connection with metal lining. Synthetic rubber shall be used either with or without metal lining.
Fuel oil and gasoline (not service station pump hose).	M-N or M-SB-9 or M-SN-9 or M-ST-6	M-P or M-SB-9 or M-SN-9 or M-ST-6	....	M-N or M-SB-9 or M-SN-9 or M-ST-6	Maximum wall: $\frac{11}{32}$" all sizes.
Garden	M-T	....	....	....	Maximum wall: $\frac{1}{32}$" (no cover permitted).
Grease—Low pressure non-industrial.	M-T	M-T	....	M-T	Maximum wall: $\frac{1}{32}$".
Hydraulic brake	M-E	M-A	....	M-A	Maximum wall: 0.195 inch for $\frac{1}{16}$" I. D., 0.230 inch for $\frac{3}{32}$" I. D.
Hydraulic control and industrial grease—High pressure.	M-M or M-SB-9 or M-SN-9	M-M or M-SB-9 or M-SN-9	....	M-P or M-SB-9 or M-SN-9	O. D.: To fill available 1 time couplings.
Medium pressure	M-M or M-SB-9 or M-SN-9	M-M or M-SB-9 or M-SN-9	....	M-P or M-SB-9 or M-SN-9	Maximum wall: ¼" on sizes $\frac{3}{16}$" I. D. and under. $\frac{5}{16}$" on sizes over $\frac{3}{16}$" I. D.
Low pressure.....	M-M or M-SB-9 or M-SN-9	....	....	M-P or M-SB-9 or M-SN-9	Maximum wall: $\frac{1}{16}$" all sizes.
Jetting and hydraulic.....	M-N	M-P	....	M-M	Maximum wall: $\frac{5}{16}$" on sizes 4" I. D. and under. $\frac{11}{32}$" on sizes over 4" I. D.
Arbor-Pipe forming	M-H	M-H	....	....	Tube: $\frac{3}{64}$" maximum.
Phosphate flexible	M-E	M-H	M-P	M-P	Tube: ¼" maximum. Cover: $\frac{1}{16}$" maximum.
Oil suction and discharge (a) Rough bore.	M-M	M-N	M-P	M-P	Tube: $\frac{1}{16}$" maximum for sizes 4" I. D. and under. $\frac{1}{64}$" maximum for sizes over 4" I. D. Lining or layer: $\frac{1}{16}$" maximum. Cover: $\frac{3}{32}$" maximum all sizes.

A. COMMERCIAL TYPES (continued)

Type of product	Compound — Tube	Friction	Layer or Filler	Cover	Construction and/or service restrictions
(b) Smooth bore	M-SB-9 or M-SN-9 or M-ST-6	M-SB-8 or M-SN-8 or M-ST-6 or M-N	M-SB-8 or M-SN-8 or M-ST-6 or M-P	M-SB-8 or M-SN-8 or M-ST-6 or M-P	Tube: 7/64" maximum for sizes 4" I. D. and under. 5/64" maximum for sizes 4" I. D. Lining or layer: 1/16" maximum. Cover: 3/32" maximum.
Pinch valve	M-E	M-H	....	M-E	Maximum wall: 1/2" on sizes 4" I. D. and under. 3/8" on sizes over 4" I. D.
Pump and windshield wiper tubing.	M-T	M-T	....	M-T	Maximum wall: 7/64" on sizes 1/4" I. D. and under. 3/32" on sizes over 1/4" I. D.
Radiator	M-T	M-T	....	M-T	Maximum wall: 1/16".
Rotary drilling	M-E	M-H	M-M	M-M	Tube: 3/32" maximum. Cover: 3/32" maximum.
Sand blast	M-E	M-N	....	M-P	Tube: Under 1"—1/16" maximum, all other 1/4". Cover: 5/64" maximum, all sizes.
Shaft covering, flexible	....	M-T	....	M-T	Cover: 1/16" maximum.
Spray—agricultural:					
High pressure	M-N	M-P	....	M-M	Maximum wall: 1/16" on sizes under 3/4" I. D. 11/32" on 3/4" I. D. 13/32" on 1" I. D. Service: Designed for working pressure in excess of 500 P.S.I.
Low pressure	M-T	M-T	....	M-T	Maximum wall: 1/16".
Spray—paint	M-N or M-SB-9 or M-ST-6	M-P or M-SB-9 or M-ST-6	....	M-P or M-SB-9 or M-ST-6	O.D.: To fit existing and available paint spray couplings. Color: Cover may be brown or black.
Steam:					
Grade 1	M-E	M-E	....	M-E	Tube: 1/16" maximum. Cover: 1/32" maximum. Service: Designed for saturated steam pressures from 100 to 200 p. s. i. or temperatures between 338 deg. and 388 deg. F.
Grade 2	M-H	M-E	....	M-P	Tube: 1/8" maximum for sizes 1" I. D. and under. 3/32" maximum for sizes over 1" I. D. Cover: 1/32" maximum. Service: Designed for saturated steam pressures from 40 to 100 p. s. i. or temperatures between 287 deg. and 338 deg. F.
Grade 3	M-Q-1	M-M	....	M-R	Tube: 7/64" maximum. Cover: 3/64" maximum. Service: Designed for saturated steam pressure up to 40 p. s. i. or temperatures up to 287 deg. F.
Suction:					
Fire engine hard	M-T	M-R	M-T	M-T	Tube: 5/64" maximum. Layer and Filler: 1/16" maximum. Cover: 1/16" maximum.
Fire engine soft	M-P	M-P	....	....	Tube: 1/16" maximum.
Hard rubber	M-R	M-R	....	M-T	Tube: 1/4" maximum on sizes 1" I. D. and under. 3/32" maximum on sizes over 1". Cover: 3/32" maximum.
Rotary slush pump	M-N	M-P	M-P	M-P	Tube: 3/32" maximum. Cover: 1/16" maximum.
Sand suction	M-E	M-H	M-P	M-P	Tube: Under 12"—1/4" maximum, 12" to 24"—3/8" maximum. All other—3/4". Cover: 1/16" maximum all sizes.
Water—Smooth bore	M-T	M-R	M-T	M-T	Tube: 1/16" maximum 3" I. D. and under. 5/64" maximum over 3" I. D. to 6" I. D. incl. 3/32" maximum over 6" I. D. Layer and filler: 1/16" maximum. Cover: 3/64" maximum 4 1/2" I. D. and under. 1/16" maximum over 4 1/2" I. D.
Tank car and tank truck	M-N or M-SB-9 or M-SN-9 or M-ST-6	M-P or M-SB-9 or M-SN-9 or M-ST-6	....	M-N or M-SB-8 or M-SN-8 or M-ST-6	Maximum wall: 11/64" on sizes under 2" I. D. 1/16" on sizes 2" I. D. to 4" I. D. 5/32" on sizes 4" I. D. and over.
Tender tank	M-Q-1	M-N	M-Q-1	M-Q-1	Tube: 5/64" maximum. Layer: 5/64" maximum. Cover: 1/32" maximum.
Vacuum brake (truck and bus)	M-N	M-N	....	M-P	Maximum wall: 13/64" on sizes under 1/2" I. D. 1/16" on sizes 1/2" I. D. and over.
Vacuum:					
Household	M-T	M-T	....	....	Tube: 1/32" maximum. No cover permitted.
Industrial	M-Q-1	M-N	....	M-P	Tube: 1/16" maximum. Cover: 1/32" maximum.
Dust collector	M-E	M-P	M-P	M-P	Tube: 1/8" maximum. Cover: 1/64" maximum.
Dust blower or exhaust	M-E	M-P	M-P	M-P	Tube: 5/64" maximum. Cover: 1/64" maximum.
Water-cold	M-T	M-T	....	M-T	Maximum wall: 1/4" on sizes 1" and under. 5/16" on sizes over 1" to 1 1/2" incl. 11/32" on sizes over 1 1/2" to 4" incl. 1/2" on sizes over 4".
Welding	M-P	M-P	....	M-P (Black) M-N (Red)	Maximum wall: 1/8" on sizes 3/16" I. D. and under. 1/16" on sizes over 3/16" I. D. Color: Cover may be red or black. Twin: Twin welding hose is permitted, provided the amount of crude rubber and R. H. C. used in the construction does not exceed that of two single lines of same size and strength.

B. *Fire hose and mill hose*

1. The following specifications (which, with respect to the use of Rubber, are identical with Federal Emergency Alternate Specifications E-ZZ-H-451a) shall apply to the manufacture of fire hose and mill hose.

2. Fire hose and mill hose shall be manufactured only in the following sizes and the maximum amount of Rubber per 100 feet for each size shall not be greater than the amount specified for each size as follows:

Nominal size:	Maximum amount of rubber permitted, per 100 feet — Pounds
1½ inches	4
2½ inches	7
3 inches	8.5
3½ inches	10

3. The rubber lining shall be made either from calendered sheets of not less than three plies lap-jointed and vulcanized into one solid body, or from a single ply extruded tube. The lap joints of calendered tubes shall be as small as is consistent with best manufacturing practice.

4. The rubber lining shall be of a thickness not less than .04 of an inch at any point when measured on specimens buffed just to the point where the fabric impressions left by the jacket are removed.

5. Each set of hose couplings shall be provided with three rubber gaskets of good quality. One gasket shall fit accurately the swivel of the couplings, and one (not less than 1/8 of an inch thick) shall be placed under the end of each expansion ring. When the coupling is made up snugly, as in service, the gasket in the swivel shall not be compressed to such an extent as to project beyond the inside surface of the coupling.

6. The hose shall have an internal diameter as shown by a tapered plug gauge of not less than the nominal size of the hose, except that in the case of 2½ inch hose, the internal diameter so measured shall not be less than 2 9/16 inches.

7. Unless otherwise specified, hose shall be furnished in

lengths averaging not less than 50 feet, measured from back to back of couplings and under a pressure of 10 pounds per square inch. No length before sampling shall be less than 48 feet.

8. The hose with couplings attached shall meet the following hydrostatic proof pressure test requirements without leakage in the hose or at the couplings or breaking any threads in the jacket.

	Numerical requirements for				
	Single jacket		Double jacket		
	1½ inch	2½ inch	1½ inch	2½ inch	3 and 3½ inch
Test pressure for initial requirements—pounds per square inch	...	...	10	10	10
Test pressure—pounds per square inch	300	300	400	400	400
Test pressure for kink test—pounds per square inch	...	...	350	350	250
Elongation at test pressure—maximum %	...	...	8	8	8
Twist to right—maximum degrees per foot	...	...	29	12.5	12.5
Twist to left—maximum degrees per foot	0	0	0	0	0
Warp—maximum inches	...	...	20	20	20
Rise—maximum inches	...	...	0	0	0

The kink test may be required on only one sample per 100 lengths. A twist to the right is indicated by a clockwise rotation of the coupling, looking from the hose toward the coupling. A twist to the left is indicated by a counter clockwise rotation. A maximum twist to the left of 2 degrees per foot will be permitted while pressure is being raised, but any final twist must be to the right. Warp is defined as deviation from a straight line.

9. A three foot sample, when subject to a burst test while lying straight, shall not burst below the pressure specified in the following table:

Kind of hose:	Burst pressure pounds per square inch
Single jacket	450
Double jacket	600

10. The hose shall meet the following tests with respect to the rubber lining:

(i) Tensile strength of at least 800 pounds per square inch when tested across the fold.

(ii) Ultimate elongation of at least 300%.

(iii) Tensile strength, as determined with test pieces ½ inch wide prepared from strips cut transversely across the fold which have been subjected to the action of dry heat of 158 degrees + or — 2 degrees Fahrenheit for 96 hours, shall be not less than 75% of the strength before heating.

11. The adhesion of the rubber lining to the jacket shall be such that a weight of 8 pounds suspended from a strip 1½ inches wide will cause separation at a rate not greater than 1 inch per minute. This requirement does not prohibit that construction wherein there is no adhesion between the jacket and lining along the fold, provided the surface over which there is no adhesion is not greater than 35% of the total surface.

C. Railroad Hose

The tube, cover, intermediate layer and friction for each of the classes of hose listed below shall be made from one of the grades of compounds listed in subdivision (c)-I-A of this revised List 1, the appropriate grade of compound for each part being that hereinbelow specified therefor opposite the description or designation of such class in Tables A, B, C and E of this subdivision III-C. The physical properties of the compounds and tests on the hose shall meet the minimum requirements specified.

1. *Air brake and air signal hose.*

TABLE A

	Grade	Minimum gauge	Minimum tensile P.S.I.	Minimum elongation	Adhesion in pounds
Tube	M-P	0.094	800	300%	12 between tube and duck.
Friction	M-N	....	....	.....	15 between plies of duck.
Cover	M-M	.063	1,200	300%	12 between cover and duck.

(i) *Cotton reinforcement.* The reinforcement shall consist of not less than four plies of cotton duck cut on a bias of approximately 45 degrees and applied evenly and firmly with not less than ½" lap not sewed. The plies of duck shall be well frictioned on both sides with M-N grade compound which shall firmly join the plies to the rubber tube and cover and to each other.

(ii) *Rubber caps.* Each length of hose shall have a rubber cap firmly vulcanized on each end.

(iii) *Sampling.* For each lot of 300 or less lengths of each size of hose, one extra length shall be furnished for test.

(iv) *Hydrostatic test.* The 17-in. section of hose shall be subjected to a hydrostatic pressure of 200 lbs. per sq. in. applied at the rate of not less than 100 lbs. per sq. in. in 6 seconds. The expansion in circumference at this pressure shall be not more than ¾ in. for airbrake or 11/16 in. for air-signal hose. The hose shall show no leaks or other defects. After the above test, the same section of hose shall be subjected to a hydrostatic pressure of 500 lbs. per sq. in. maintained for 10 minutes without leaking, bursting or showing other defects; after which the pressure shall be increased until the hose bursts, which shall not occur at a pressure less than 700 lbs. per sq. in.

(v) *Dimensions and tolerances.* The dimensions and tolerances of the hose shall be as follows:

	Length in inches	Outside diameter in inches	Inside diameter in inches	Thickness of end cap, in inches
Air-brake hose:				
Maximum	22½	2⅛	$1\frac{7}{16}$	4/32
Minimum	22	$2\frac{1}{16}$	1⅜	1/32
Air-signal hose:				
Maximum	22½	1⅞	$1\frac{3}{16}$	4/32
Minimum	22	$1\frac{13}{16}$	1⅛	1/32

(vi) *Label.* The label shall be in accordance with AAR Specifications EM-601-42.

2. *Tender tank hose.*

TABLE B

	Grade	Minimum gauge	Minimum tensile P. S. I.	Minimum elongation, percent	Adhesion in pounds
Tube	M-Q-1	0.070	600	200	10 between tube and duck
Friction	M-N	....	...	...	12 between plies of duck
Intermediate	M-Q-1	.070	...	...	10 between int. layer and duck
Cover	M-Q-1	.060	600	200	10 between cover and duck

(i) *Cotton reinforcement.* The reinforcement shall consist of plies of cotton duck cut on a bias of approximately 45 degrees and applied evenly and firmly with not less than ½" lap not sewed. The plies of duck shall be well frictioned on both sides with M-N grade compound which shall firmly joint the plies to the rubber tube, cover, and intermediate layer and to each other. A distinct intermediate layer of rubber shall be readily visible when the finished hose is cut open. At each end of the hose there shall be an extra ply of duck under the cover and extending for 6 inches from the end of the hose.

(ii) *Helical wire reinforcement.* The helical reinforcement shall be of thoroughly galvanized or copperized spring steel wire No. 9 BWG (0.148 inch). It shall be wound with not over 1 inch pitch throughout the length of the hose up to a point distant 3½" from each end of the hose. At this point the wire shall be turned to a straight line parallel with the axis of the hose and shall extend to a point 1 inch from the ends of the hose.

(iii) *Intermediate rubber layer.* The intermediate layer of rubber shall be formed completely around the wire and bonded to the duck.

(iv) *Sampling.* For lots of 25 to 100 lengths, an 18 inch prolong shall be built on one length of hose. This prolong will then be cut off by the inspector for testing. For lots less than 25, no prolong shall be supplied.

(v) *Boiling water test.* Samples of the tube, removed from the hose and buffed to a uniform thickness shall be immersed in boiling water for a period of 8 hours. After removal and drying for 24 hours the type A test specimen shall be died from the immersed sample and tested. The tensile strength shall not be less than 50% of the original.

(vi) *Bend test.* A complete length of hose shall be bent 180 degrees until two ends are parallel. The diameter of the inside of the bend shall be equal to three times the nominal inside diameter of the hose. The hose when bent in this position shall show no kinking.

(vii) *Tolerance.* (1) The inside diameter may vary by not more than 1/32" either way from that specified.

(2) The outside diameter over soft ends of hose shall conform to the following table:

Nominal inside diameter in inches	Maximum in inches	Minimum in inches
2¼	3¼	3⅛
2½	3½	3⅜
3	4	3⅞
3½	4½	4⅜
4	5	4⅞
4½	5½	5⅜

(viii) *Label.* The label shall be in accordance with AAR Specification EM-606-42.

3. *Cold water hose.*

TABLE C

	Grade	Minimum gauge	Minimum tensile, P. S. I.	Minimum elongation, Percent	Adhesion in pounds
Tube	M-T	0.050	400	150	{5 sizes ¾" and under {6 over ¾"
Friction	M-T	....	...	...	6 all sizes
Cover	M-T	.047	550	200	{5 sizes ¾" and under {6 over ¾"

(i) *Cotton reinforcement.* The reinforcement shall consist of cotton duck for wrapped hose and braided fabric for braided hose. The plies of duck shall be well frictioned on both sides with M-T grade compound which shall firmly join the plies to the reclaim rubber tube and cover and to each other. The plies of braided fabric shall be separated by a friction layer of M-T grade compound which shall firmly join the plies to the reclaim rubber tube and cover and to each other.

(ii) *Sampling.* From each lot of 1000 feet or less of each size of hose, a three foot section shall be taken for test purposes.

(iii) *Hydrostatic test, dimensions, plies and tolerances.* The straight burst, the inside and outside diameters, minimum number of plies, shall be as specified in the following Table D.

(iv) *Label.* The label shall be in accordance with AAR Specification EM-604-42.

(v) *Color.* All compounds shall be black.

TABLE D

Size, I. D.	Outside diameter, maximum	Minimum number of plies, Wrapped	Minimum number of plies, Braided	Straight burst, minimum
½	1 1/16	3	2	600
¾	1¼	3	2	600
1	1½	4	2	500
1¼	1⅞	4	3	500
1½	2⅛	4	3	450
2	2¾	4	..	450
2½	3 5/16	5	..	450
3	3 13/16	5	..	450
3½	4 5/16	5	..	350
4	4 13/16	5	..	300

NOTE: The inside diameter may vary either way from that specified by not more than 1/32" for sizes ¾" and smaller, and by not more than 1/16" for larger sizes.

4 *Air, gas and oxygen hose.*

TABLE E

	Grade	Minimum gauge	Minimum tensile, P. S. I.	Minimum elongation, Per cent	Minimum adhesion in pounds
Tube:					
3/8" and under	M-P	.050	600	200	7
7/16" to 1" incl.	M-Q-1	.063	600	200	8
Over 1"	M-Q-1	.078	600	200	8
Friction:					
3/8" and under	M-P	...	...	...	7
Over 3/8"	M-P	...	...	...	10
Cover:					
3/8" and under	M-P (Black)	.020	700	250	5
3/8" and under	M-N (Red)	.020	700	250	5
Over 3/8"	M-P	.063	800	250	8

NOTE: 1/2" gas and oxygen hose, if required, shall conform to same specifications as 3/8" and under for tube, friction and cover.

(i) *Cotton reinforcement.* The reinforcement shall consist of cotton duck for wrapped hose and braided fabric for braided hose. The plies of duck shall be well frictioned on both sides with M-P grade of compound which shall firmly join the plies to the rubber tube and cover and to each other. The plies of braided fabric shall be separated by a friction layer of M-P grade compound which shall firmly join the plies to rubber tube and cover and to each other.

(ii) *Sampling.* From each lot of 1,000 feet or less of each size of hose, a three foot section shall be taken for test purposes.

(iii) *Hydrostatic test, dimensions, plies and tolerances.* The straight burst, the inside and outside diameters, minimum number of plies, and tolerances and dimensions shall be as specified in the following Table F.

(iv) *Label.* The label shall be in accordance with AAR Specification EM-603-42.

(v) *Color.* All compounds shall be black except the cover on hose for acetylene-hydrogen which shall be red.

TABLE F

Size, I. D.	Outside diameter, maximum, Inches	Minimum number of plies, Wrapped	Minimum number of plies, Braided	Straight burst, minimum
1/4"	5/8	4	2	900
5/16"	11/16	4	2	700
3/8"	3/4	4	2	600
1/2" gas and oxygen	7/8	4	2	550
1/2"	1 1/16	4	3	800
3/4"	1 11/32	4	3	700
1"	1 11/16	4	3	700
1 1/4"	1 13/16	5	3	600
1 1/2"	2 3/16	5	3	550

NOTE 1: The inside diameter tolerance shall be plus or minus 3/128" on sizes 3/8" and under; plus or minus 1/32" on sizes 1/2" and 5/8", and plus or minus 1/16" on sizes over 3/4". NOTE 2: The minimum O. D. on the 1/4", 5/16" and 3/8" sizes of gas and oxygen hose shall not be less than 1/16" under the maximum specified O. D.

IV. *Packing specifications—commercial types*

Packing of the following types shall be made from one of the grades of compounds listed in subdivision (c)-I-A of this revised List 1, the appropriate grades of compound to be used being that hereinbelow specified therefor opposite description or designation of such types.

Description	Grade	Non-fabric reinforced compound	Fabric-reinforced Face compound	Fabric-reinforced Friction compound	Construction and/or service restrictions
Standard rubber sheet, including cut or extruded strip, gaskets or packing rings, or molded packings not elsewhere defined.	1	M-M-2	.....	.....	(a) Designed for use against foodstuffs or chemicals where contamination or the imparting of undesirable odors or taste is to be avoided. (b) Designed for use against saturated steam at pressures in excess of 50 P. S. I. (c) Shore hard 75 minimum. (d) Color may be red or black.
Packing known heretofore as Red or Black Sheet Packing.	2	M-S	.....	.....	Designed for service other than lists for Grade 1. Shore hard 75 minimum.
Soft rubber sheet, including cut or extruded strip gaskets, packing rings, or molded packings not elsewhere defined.	1	M-K	.....	.....	Soft rubber sheets in grades 1, 2, and 3 are to be used only in packing designed for services where a grade softer than standard rubber sheet is absolutely necessary. Grade 1—Shore hard 45-55. Grade 2—Shore hard 55-65. Grade 3—Shore hard 65-75.
	2	M-N	.....	.....	
	3	M-P-1	.....	.....	
Cloth insertion sheet, including cut strip or gaskets.	..	.....	M-S	M-R	
Strip packing:					
Cloth inserted	1	.....	M-S	M-R	Special packing designed for use only for bolted tanks.
Plain	2	M-P-1	.....	.....	
Diaphragm sheet including cut diaphragms Supersensitive.	1	.....	M-B	M-E	Grades 1 and 2 designed for control diaphragm service. Color of Grade 1 may be black or amber.
Standard	2	.....	M-N	M-N	Grade 1 shall be used only in packing designed for exceedingly flexible diaphragm not exceeding 1/32 in. in thickness.
Piston packing hydraulic known heretofore as white hydraulic.	..	.....	.....	M-K	No skim coat, cushion layer, or covers permitted.
Rod packing: Duck rubber slab construction, known heretofore as low pressure ring, low pressure spiral, or cross expansion packing.	..	.....	M-P-1	M-P-1	Skim coat shall not exceed 0.010 in. Covers shall not exceed 0.016 in. Cushion layers (except skim) not permitted.

Description	Fabric reinforced friction compound	Core compound	Crude rubber by weight	Construction and/or service restrictions
Rod packing:				
Duck-rubber	M-P-1	M-S	.....	No skim coat, or rubber cover permitted. Made with or without central rubber core. Round or square cross section.
Rolled	....	....	.....	
Rod packing:				
Molded V	M-N	....	.....	Skim coats permitted. Cushion layers and rubber covers not permitted.
Shape or lip	....	....	.....	
Rod packing:				
Molded channel with metal core, known as semimetallic.	M-N	....	.....	Skim coats permitted. Cushion layers and rubber covers not permitted.
Rod packing:				
Rubber bonded	....	....	.....	
Plastic	....	....	5% maximum	Color: not specified.
Rod packing:				
Rubber bonded	....	....	.....	
Metal foil	....	....	2% maximum	Color: not specified.
Compressed asbestos sheet	....	....	13% maximum	Color: not specified.
Rubberized woven asbestos cloth or braid, including unmolded gaskets or rod packings prepared from same:	....	....	.....	A rubber cushion or core may be used.
Metallic	....	M-S	10% maximum (based on weight of fabric)	
Non-metallic	....	M-S	13% maximum (based on weight of fabric)	

NOTE: All compounds shall be black only except where otherwise specified.

V. *Dam and lock gate seal specifications*

The tread, cushion, friction and coat for dam and lock gate seals shall be made from one of the grades of compounds listed in subdivision (c)-I-A of this revised List 1, the appropriate grade of compound to be used being that hereinbelow specified therefor opposite description or designation of each construction element in Table A of this subdivision V.

TABLE A

Construction element	Compound	Minimum tensile strength in pounds per square inch	Minimum elongation, Percent	Shore hardness	Minimum ply adhesion in pounds
Tread	M-N	1,500	350	60-70	..
Cushion	M-B	2,000	700	35-47	..
Friction and coat	M-H	....	...	....	16

VI. *Hog scraper (beater) paddle specifications*

Compounds for each of the grades of hog scraper paddles listed in Table A of this subdivision VI shall be made from one of the compounds listed in subdivision (c)-I-A of this revised List 1, the appropriate grade of compounds to be used for covers, friction and coats being that hereinbelow specified therefor opposite the description or designation of such class in such Table A.

TABLE A

Description	Cover compound	Friction compound	Coat or skim compound
Rubber covered	M-R	M-N	M-E
Friction surface	....	M-N	M-E

NOTE 1: The skim or coat shall not exceed .010 inch in thickness. Where skim coats are not used, a cushion layer of same quality as the skim may be used provided it does not exceed the combined gauges of the permissible skims. NOTE 2: Maximum combined gauges of covers shall not exceed $\frac{1}{8}$ inch. NOTE 3: All compounds shall be black.

VII. *Loom pickers*

Compounds for each of the types of loom pickers shall be made from one of the grades of compounds listed in subdivision (c)-I-A of this revised List 1, the appropriate grade of compound to be used being that hereinbelow specified therefor opposite description or designation of such type:

Type product:	*Compound*
Loom pickers for cotton weaving	M-P-1
Loom pickers for rayon weaving	M-K-1
Reversible drop box pickers for cotton or rayon	M-K-1

NOTE: The compound specified above shall be employed only as a friction for the fabric.

VIII. *Milk and milking machine equipment specifications*

Compounds for each of the following type of rubber parts for milk and milking machine equipment shall be made from one of the grades of compounds listed in subdivision (c)-I-A of this revised List 1, the appropriate grade of compound to be used being that hereinbelow specified therefor opposite description or designation of such type.

Type product:	*Compound*
Milking inflations	M-A
Milking tubing (single line)	M-H-1
Milking tubing (twin line)	M-M-1
Bottle filler rubbers	M-H-1
Miscellaneous parts such as special gaskets, gland rings, bowl rings, etc.	M-K

NOTE: All compounds, except milking inflations, shall be black.

IX. *Pipe coupling ring specifications*

Compounds for each of the grades of pipe coupling rings listed in Table A below shall be made from one of the grades of compounds listed in subdivisions (c)-I-A and (c)-I-B of this revised List 1, the appropriate grade of compound to be used being that hereinbelow specified therefor opposite the description or designation of such grade in Table A of this subdivision IX.

TABLE A

Grade	Compound	Service restriction
1	M-H	Designed for use only for coupling rubbers having an annular section compressed in application and afterward functioning without other means of support, and for repair clamp gaskets.
2	M-N	All other rubber couplings not specifically covered under Grade 1.
3	M-SB-8 or M-SN-6	All couplings made from synthetic.

NOTE: No crude rubber or synthetic rubber shall be used in the manufacture of pipe coupling rings designed for handling cold, clear water (i. e., water which is not artificially heated, and which is fresh, as distinguished from salt sea water or water contaminated by sewage or other impurities).

X. *Press die pad specifications*

Compounds for press die pads shall be made from one of the grades of compounds listed in subdivision (c)-I-A of this revised List 1, the appropriate grade of compound to be used being that hereinbelow specified therefor opposite description or designation.

Grade	Compound	Shore durometer
No. 1	M-A	Under 40
No. 2	M-E	40 and over

NOTE: In order to reverse the pad so that both sides can be used, pads shall not be manufactured with the rubber compound vulcanized to a steel plate. NOTE: All compounds shall be black.

XI. *Printing rubber products specifications*

Compounds for each of the types of printing rubber products shall be made from one of the grades of compounds listed in subdivisions (c)-I-A and (c)-I-B of this revised List 1, the appropriate grade of compound to be used being that hereinbelow specified therefor opposite the description or designation of such type.

Type product	Shore durometer	Compound
Printing plate gums	46-55	M-M-1 or M-SB-8 or M-SN-7
Printing plate gums	55-65	M-J-1 or M-SB-9 or M-SN-8
Printing plate gums	66-90	M-Q-1 or M-SB-10 or M-SN-9
Printing plate insert and backing fabrics	.....	M-R-1 or M-SB-8 or M-SN-8
Offset blankets	.....	M-J-1 or M-SB-7 or M-SN-6
Newspaper blankets	.....	M-L-1 or M-SB-8 or M-SN-7 or M-ST-5
Cutting rubber	.....	M-I-1 or M-SB-7 or M-SN-6
Printing rolls	.....	M-J-1 or M-SB-7 or M-SN-6
Engraving rubber face stock	30-55	M-M-1 or M-SB-8 or M-SN-7
Engraving rubber face stock	56-75	M-N-1 or M-SB-8 or M-SN-7
Engraving rubber face stock	76-90	M-P-1 or M-SB-9 or M-SN-8
Engraving rubber friction	.....	M-Q-1 or M-SB-8 or M-SN-7
Engraving rubber filler	.....	M-Q-1 or M-SB-10 or M-SN-9
Box die gums	.....	M-N-1 or M-SB-7 or M-SN-6

NOTE 1: In any combination of compounds, any one or group of compounds may be higher in crude rubber and R. H. C. volume than the designated compound grade provided the total volume of crude rubber and R. H. C. of all compounds is not in excess of that permitted. NOTE 2: Any synthetic rubber, if available, may be substituted on a volumetric basis for a portion of the R. H. C. NOTE 3: The thickness of face stocks on engraving rubber shall not exceed ⅛".

XII. *Rubber lined tanks, drums and rubber protected industrial equipment specifications*

Compounds for each of the following types of rubber lined tanks, drums and rubber protected industrial equipment shall be made from one of the grades of compounds listed in subdivision (c)-I-A of this revised List 1, the appropriate grade of compound to be used being that hereinbelow specified therefor opposite the description or designation of such type in Table A of this subdivision XII.

TABLE A

Type of equipment	Compound	Construction and/or service restrictions
Rubber lined drums and tanks (hard or soft rubber)	M-F	⅛" maximum thickness designed for use for temperatures up to and including 150° F. 3/16" maximum thickness designed for use for temperatures in excess of 150° F.
Rubber lined pipes and fittings	M-F	⅛" maximum thickness in pipes up to and including 3" diameter, regardless of anticipated temperature; also in pipes over 3" in diameter designed for use where temperature is not in excess of 150° F. 3/16" maximum thickness for pipes over 3" in diameter designed for use where temperature is in excess of 150° F.

NOTE 1: The lining of tank cars is to be in accordance with I. C. C. specifications. NOTE 2: No crude rubber shall be used in the lining of tanks, pipe, and fittings for any operation connected with the plating of materials. NOTE 3: No crude rubber shall be used in lining or covering tanks and drums, pipe and fittings, or any other items listed in Note 7 of this subdivision XII where designed for purely abrasive services where no corrosive liquids are present. NOTE 4: No outside rubber covering shall be permitted extending more than a vertical distance of 2" below the outside top edge of any rubber lined tank or more than 2" from the outside edge of any rubber lined cover. NOTE 5: Where oxidizing chemicals and chemicals having a solvent action on rubber are involved, an additional $\frac{1}{16}$" thickness may be employed. NOTE 6: Where closed vessels or tanks operating under a vacuum of 18" of mercury or more are involved, an additional thickness of $\frac{1}{16}$" may be used. NOTE 7: Rubber protected fume ducts, fans, racks, frames, trays, screens, buckets, pails, dippers, agitators, funnels and measures (for handling corrosive materials and explosives), pumps, blowers, exhauster and pump lining, valves, and valve parts, miscellaneous rubber covered industrial equipment shall employ same restrictions and compounds as "Rubber lined tanks and drums." NOTE 8: In no case shall the thickness of any rubber lining exceed $\frac{3}{16}$".

XIII. *Abrasive implements specifications*

Crude rubber may be used in the manufacture of only rubber bonded implements designed for the types of work listed below. The appropriate grade of compound to be employed is that listed as M-M-2 in subdivision (c)-I-A of this revised List 1.

Ball and roller race; Cut-off and thin slotting; Stainless welds; Heat sensitive and non-ferrous alloys; Centerless and control; Soft polishing and bonded cork; Rubber asbestos products; Shank mounted; Disc mounted tie gum; Weld grinding at bottom of slots.

XIV. *Mine and industry safety parts specifications*

Compounds for each of the mine and industry safety parts listed below shall be made from one of the grades of compounds listed in subdivision (c)-I-A of this revised List 1, the appropriate grade of compound to be used being that hereinbelow specified therefor opposite the description or designation of such grade in Table A of this subdivision XIV.

TABLE A

Type of product	Compound	Construction
Face pieces, respirators, goggles and accessories not elsewhere listed.	M-K-1	
Corrugated tubes	M-L	
Flutter valve, valve mechanisms and valve assemblies.	M B	

TABLE A (Cont'd)

Type of Product	Compound		Construction
	Friction	Cover	
Hose mask hose, as required by Bureau of Mines.	M-N	M-P	Maximum cover .094 inch. I. D., 1 inch only. Maximum O. D., 1 7/16 in.

Amendment No. 10

Section 940.5 (*Supplementary Order M-15-b-1*) is amended as follows:

1. By changing paragraph (b) (6) to read as follows:

(6) Rubber footwear, List 6.

2. By substituting the attached List 6 for List 6 now attached to such Order.

This Order shall take effect as of the date of its issuance.

Issued this 21st day of July, 1942.

AMORY HOUGHTON,
Director General for Operations

LIST 6 (Revised effective July 21, 1942). *Specifications for the manufacture of rubber footwear.*

(1) All rubber footwear shall be manufactured in black color only.

(2) No crude rubber shall be used for label plasters.

(3) Production of civilian footwear shall be confined to the following items and the average amount of crude rubber per pair used in the manufacture of each item shall not be greater than the indicated maximum weight.

Item	Average weight of crude rubber per pair maximum (in pounds)
Men's short boot (14" height, square top)	1.00
Men's 4-buckle cloth farm-weight arctic	.65
Men's 4-buckle cloth lightweight arctic	.55
Boys' 3-buckle cloth lightweight arctic	.45
Youths' 3-buckle cloth lightweight arctic	.40
Women's 2-snap gaiter (rubber)	.25
Misses' 2-snap gaiter (rubber)	.25
Child's 2-snap gaiter (rubber)	.20
Men's work rubber	.50
Men's dress rubber (soft back)	.30
Men's clog	.125
Boys' dress rubber (soft back)	.25
Youths' storm rubber	.25
Women's toe rubber	.10
Growing girls' storm and women's over (maximum 16/8 heel)	.20
Misses' storm rubber	.20
Child's storm rubber	.17

(4) Production of severe occupational footwear shall be confined to the following items and the average amount of crude rubber per pair used in the manufacture of each item shall not be greater than the indicated maximum weight.

Item	Average weight of crude rubber per pair maximum (in pounds)
Men's short boot (plain toe)	1.50
Men's short boot (steel toe)	1.57
Men's storm king boot (plain toe)	2.00
Men's storm king boot (steel toe)	2.07
Men's hip boot (plain toe)	2.30
Men's hip boot (steel toe)	2.37
Men's 15" lace mine pac (plain toe)	1.50
Men's 15" lace mine pac (steel toe)	1.57
Men's workshoe (plain toe)	.95
Men's workshoe (steel toe)	1.02

(5) Variations from the average weight of crude rubber per pair maximum for civilian and severe occupational footwear are permitted as follows: Plus 10%; Minus Unlimited.

Amendment No. 11

Section 940.5 *(Supplementary Order M-15-b-1)* is amended as follows:

1. By changing paragraph (b) (2) thereof to read as follows:

(2) Soles and heels, List 2.

2. By attaching thereto the attached list designated "List 2 (Revised effective August 5, 1942)."

Issued this 5th day of August, 1942.

AMORY HOUGHTON,
Director General for Operations

LIST 2 (Revised effective August 5, 1942). *Specifications for the manufacture of soles and heels.*

These specifications set forth in this revised List 2 shall apply to the manufacture of soles, taps, heels and heel bases to fill all orders, including war orders and orders placed by any department or agency of the government of the United States. However, these specifications do not apply to conductive soles and heels.

(a) *Compounds*

(1) HEELS

Compound grade	Maximum percent by volume: Crude rubber	Total RHC	Uncured friction scrap	Abrasive index	P & J hardness: Maximum	Minimum
HC	0	55	0	25	*.80 mm.	.50 mm.
HD	0	50	0	20	.80 mm.	.50 mm.
HE	0	45	0	15	.80 mm.	.50 mm.
HF	0	45	0	10	.80 mm.	.50 mm.
HL	0	45	10	26	.....	.....

(2) SOLES AND TAPS

HL	0	45	10	26	.....	.....
HM	0	55	0	20	*.53 mm.	.42 mm.

* For reference only, the following equivalent Shore durometer hardness figures, which are approximately equivalent, are given for the Pusey and Jones (P&J) hardness figures, designated in the table above.
P & J .80 mm. to .50 mm. equivalent to 65 to 80 Shore.
P & J .53 mm. to .42 mm. equivalent to 75 to 82 Shore.

NOTE 1: For all heels, soles and taps manufactured from above compounds a minus tolerance of two points from the specified abrasive index requirement is permitted with an unlimited plus tolerance. NOTE 2: The total rubber hydrocarbon (RHC) is the sum total of crude rubber and the average rubber value of reclaimed rubber expressed on a volume basis. For Grade HL compound the RHC of the uncured cord friction scrap is not included in the total. NOTE 3: Reclaimed rubber of a quality better than first quality whole tire grade is not permitted to be used in any of these compounds. NOTE 4: Only reclaimed rubber of a quality lower than whole tire grade is permitted in Grade HF compound, and this material shall not contain any reclaimed rubber derived from pneumatic or solid tires, tubes, floating scrap or any part thereof. All heels made of HF compound shall have a minimum tensile of 400 p. s. i. with a minimum elongation of 150% in addition to meeting other requirements set forth for such heels in subdivision (a) (1) of this revised List 2. NOTE 5: Black is the only color permitted in heels, soles and taps. NOTE 6: Not less than 3% of suitable anti-oxidants by weight based on the total weight of rubber hydrocarbon (RHC) shall be used in the above sole and tap compounds, HL and HM; one third of which shall be of a recognized flex resisting type. NOTE 7: In grade HL sole, tap and heel compound clean cut cotton cords or cords from tire carcasses may be added to meet the necessary physical requirements for a corded sole or heel. NOTE 8: The methods of Federal Specification EA-ZZH141 and ZZ R601 shall be applicable to these specifications.

(b) *Heels and heel bases*

1. Corded heels, either transverse or cord on end, shall be made only from Grade HL compound, and shall be used only to fill war orders.

2. Grade HC heel is limited to the types of heels using an inert core, and is permitted for use on war orders only.

For whole heels a core of 0.366" ± .03" thickness shall be used, while for half heels a core of 0.183" ± .015" thickness shall be used.

3. Grade HD heel is limited to the regular washer well type, and is permitted for use on war orders only.

4. For "Steel Plate" heel only compound Grade HE or HF may be used, with the tensile, elongation and abrasive index requirements waived and the hardness shall be between .18 mm. and .40 mm.

5. For heel bases only Grade HF compound shall be used with the tensile, elongation and abrasive index requirements waived and the hardness shall be between .18 mm. and .40 mm.

6. All heels except those to fill war orders shall be made of Grade HE or Grade HF compounds only. The use of compound grade HE after August 15, 1942, is prohibited.

(c) *Soles and taps*

1. Composition soles and taps shall be made only from Grade HM compound, which shall be used to fill all orders,

1912

Thirty years ago...

In the summer of 1912, when 3,000 was good tire mileage, when twenty-five miles per hour was fast driving, and dust and dusters ruled the road, important rubber history was written. It was then that the first practical application of carbon black was made in the reinforcing of rubber tires. It was then that Binney & Smith Company was called upon to undertake the furnishing of the pioneer black in the rubber industry, and it was that black which has since become world-renowned as — MICRONEX.

AND THIRTY YEARS *Later...*

1942

WHEREVER the Army rolls, flies, marches or bivouacs, there you will find many of the Columbian Carbon—Binney & Smith products.

Present production is almost entirely for war uses with a very minor portion for essential civilian needs. The results of our sixty years of research and experience now are being applied to helping in the greatest task ever undertaken by the Nation.

● **MICRONEX,** improved through the years to a high state of perfection, is giving its greatest service in the manufacture of tires for all military purposes. Micronex also is contributing to the quality of insulated wire, mechanical specialties and footwear.

● **FURNEX,** the pioneer semi-reinforcing carbon black, is helping to extend the dwindling natural rubber stock pile.

● **STATEX,** a specialty black, serves in the manufacture of electrical conducting compounds limited to war work.

In addition research is progressing in cooperation with the Army and Navy on confidential projects involving the use of carbon black in rubber.

● **MAGNETIC PIGMENTS** (pure oxides of iron) form a large proportion of the pigment content of the O. D. Lustreless Enamel so widely used on planes, tanks, guns, trucks and helmets. Also special coatings for tents and other fabrics.

● **BONE BLACKS** are finding wide application in protective coatings for military textiles such as fire-resistant tent cloths.

The new problems in relation to the processing of synthetic rubber have been under investigation by our Technical Department for some time in cooperation with the Rubber Industry. Carbon black is positively essential for the reinforcement of synthetics which lack tensile strength, elasticity and other properties inherent in natural rubber. Both channel and furnace blacks have important implications in this respect.

Possessing an experience of sixty years in carbon black, we are happy to cooperate fully with the Rubber Industry in solving one of the greatest problems that confronts the Nation.

COLUMBIAN COLLOIDS

BINNEY & SMITH CO. • COLUMBIAN CARBON CO

DISTRIBUTOR MANUFACTURER

including war orders and orders placed by any other department or agency of the United States Government.

2. Corded soles and taps, either transverse or cord on end, shall be made from Grade HL compound only, and shall be used only on orders for utility shoes or for war orders and orders placed by any other department or agency of the United States Government.

3. A cord sole compound containing not more than 20% by volume of uncured friction scrap may be used up to (but not including) October 1, 1942, to fill purchase orders for soles and taps placed by or for the account of the United States Marine Corps, or for soles and taps to be incorporated physically in service shoes to be delivered to or for the account of the United States Marine Corps.

Amendment No. 12

Section 904.5 *(Supplementary Order M-15-b-1)* is hereby amended by substituting the attached Revised List 15 for List 15 now attached to such order.

This order shall take effect as of the date of its issuance.

Issued this 3rd day of August, 1942.

AMORY HOUGHTON,
Director General for Operations

LIST 15 (Revised effective August 3, 1942). *Specifications for the manufacture of feeding nipples.*

(a) *Infants' nipples:*

(1) *Molded type.* The weight of rubber in each finished nipple shall not exceed .0105 pound.

(2) *All other types.* The weight of rubber or latex in each finished nipple shall not exceed .007 pound.

(b) *Lambs' nipples:* The weight of rubber or latex in each finished nipple shall not exceed .0105 pound.

Amendment No. 13

Section 904.5 *(Supplementary Order M-15-b-1)* is hereby amended as follows:

1. By changing paragraph (b) (14) to read as follows:

(14) Miscellaneous articles to fill war orders, List 14.

2. By substituting the attached Revised List 14 for List 14 now attached to such order.

This order and the list attached hereto shall become effective on August 17, 1942.

Issued this 10th day of August, 1942.

AMORY HOUGHTON,
Director General for Operations

List 14. *Prohibition on the use of Crude Rubber, Latex, Reclaimed Rubber and Scrap Rubber in the manufacture of certain products to fill war orders.*

No person shall, unless otherwise expressly authorized by the Director General for Operations, (1) use any crude rubber or latex in the manufacture or assembly of any of the products or materials listed in Groups A and B of this Revised List 14 for delivery to fill any war order; or (2) use any reclaimed rubber or scrap rubber to manufacture or assemble any of the products or materials listed in Group B of this Revised List 14 for delivery to fill any war order.

Group A. *Products and materials for which crude rubber and latex shall not be used.*

Accelerator treadle connections; brush-setting compounds; bumpers (automotive axle); bumper stripping; cellular discs; channel rubber (except airplane); combined fabrics (except as specified by List 3 attached to Supplementary Order No. M-15-b-1, as amended); cowl vent seals and gaskets; cowl vent hose; dust and lever housing covers; erasers (including typewriter); escalator handrails; flyers' clothing bags (Type B 4); fly paper; foot boards (motorcycle); friction tape; gym and basketball shoes (except cement and foxings); handle grips (except dielectric); labels; mallet heads; Marbon B, (except wire and cable insulation); Pliofilm, Plioform, and Pliolite (except moisture proof envelopes for parts for airplanes, tanks and guns and wire and cable insulation); recoil pads (except machine gun and eye buffers); rubber bands (except parts of combat equipment); rubberized curled hair or vegetable fibre; sponge cushioning including seat bottoms, seat backs, armrests, headrests, parachute backs and seats and tank crash pads and linings and all other (except vision and gunsight slot pads, mask parts, ear cushions, and cushioning for cameras, flight control and fire control instruments); toilet seat bumpers; water, garden and lawn hose (except as specified by List 1 attached to Suplementary Order No. M-15-b-1, as amended); weatherstrip (except airplane).

Group B. *Products and materials for which crude rubber, latex, reclaimed rubber, and scrap rubber shall not be used.*

Artificial leather and upholstery; ash trays; athletic equipment (except clothing); bath sprays, sponges and soap dishes; bumper tacks; buttons (clothing); canvas water bags; cap covers; cartridge clip boxes; cellular pads for crash helmet cushions; channel filler and glazing rubber (except airplane); chevrons; desk and chair protection pads; desk sets; dish-drainers; door checks and bumpers (reclaimed rubber and scrap rubber may be used for automotive parts); door knob covers; fan bases and blades (reclaimed rubber and scrap rubber may be used for combat tank equipment); faucet caps; fender protective plates; fender welting; flooring (except conductive); fly swatters; footbath trays; gear shift knobs; grommets (except airplane and dielectric); gun grips; hood supports and bumpers; hospital sheeting; inkwells and bottles; kneeling pads; leather finishes; link mats (reclaimed rubber and scrap rubber may be used for airplane walkways, pilot house, bridge deck and gun platforms).

Mastic deck covering (except repair); mats and matting (except switchboard and conductive; reclaimed rubber and scrap rubber may be used for airplane walkways, pilot house, bridge deck and gun platforms); molded wheels and casters (except hospital and surgical equipment and airplane tailwheels); name plates; office machine silencers; paper padding adhesives; paving blocks; pedal rubbers; picture screens; plate wipers; plywood adhesives; rubber-covered lamp guards, handles, grab rails and knobs (except dielectric); sateen gimp; serving trays; sewage disposal bags and paper; shims (automotive); sink pads, mats, sprays and stoppers; stair and step treads (except conductive); steering wheels; step plates; stove top pads; table tops (except conductive); tank fenders and flaps; telephone bases; tent fabrics; thermostat covers; thread; tile and tiling (except conductive); toilet closet gaskets; toilet seats; tractor and implement tires; typewriter keys; valve stems (for tire tubes); wainscoting; wheelbarrow and lawnmower tires; window squeegees; wrestling mat covers; zipper tabs.

Amendment No. 10 to Supplementary Order No. M-15-b

Supplementary Order No. M-15-b is hereby amended by inserting at the end thereof the following new paragraph designated paragraph (o):

(o) *Restrictions on the importation of rubber, latex, reclaimed and scrap rubber and balata and products thereof:* No person, other than Metals Reserve Company, Defense Supplies Corporation, Rubber Reserve Company, or any other subsidiary of the Reconstruction Finance Corporation organized under section 5 (d) of the Reconstruction Finance Corporation Act,

as amended, or any agent acting for one of them, shall, without the written authorization of the Director of Industry Operations, import, purchase for importation, or make any contract or other arrangement for the importing of any rubber, latex, reclaimed and scrap rubber or balata, whether in crude, partly processed or processed form, or any finished or partly finished product or material made in whole or in part from any of the foregoing. For the purpose hereof "import" means to transport into the continental United States from any foreign country or from any territory or possession of the United States, and shall include a release from the bonded custody of the United States Bureau of Customs.

This Order shall take effect as of the date of its issuance.

Issued this 19th day of June, 1942.

J. S. KNOWLSON,
Director of Industry Operations

Supplementary Order No. M-15-f
Restricting the Use of Rubber Cements and Adhesives

(a) *Definitions.* For the purposes of this order:

(1) "Person" means any individual, partnership, association, business trust, corporation, governmental corporation or agency, or any organized group of persons, whether incorporated or not.

(2) "Rubber cement" means any type of cement, adhesive or coating made in whole or in part of crude rubber, latex, reclaimed rubber or scrap rubber.

(b) *Restriction on the use of rubber cement.* Except as otherwise permitted by general or special authorization of the Director General for Operations, no person who for compensation or profit engages in manufacturing, repairing, combining, laminating, coating, impregnating or otherwise treating any luggage, handbags, belts for wearing apparel, pocketbooks, wallets, key rings or cases, hats or other millinery, cosmetic appliances, cosmetic bags, tobacco pouches, furs or embroidered or other materials for emblems, pennants, chevrons, appliques or other similar decorative material, or in laminating, combining or treating any fabrics or materials, or in manufacturing shoes, shall use any rubber cement in manufacturing, repairing, combining, laminating, coating, impregnating or treating any such products or materials; except that rubber cement may be used (i) in the following operations only in the manufacture or repair of shoes: Cutting and fitting room operations, bed and side lasting, folding, gem duck, heel breasting, insole rib and lip, moccasin seam, prewelt, platform attaching (but only if no equipment for the use of another method is available), rand, soft box toe, sole attaching, semi-automatic toe lasting (but only if no equipment for the use of another method is available), unishank, leather welting, channelling McKay shoes and Littleway sewed shoes (but no others), and shoe repair, and (ii) in the manufacture, application or repair of any products for the manufacture of which crude rubber, latex, reclaimed rubber or scrap rubber may be consumed under the provisions of § 940.3 (Supplementary Order No. M-15-b), as amended from time to time.

(c) *Restriction on the purchase and sale of rubber cement.* No person shall purchase rubber cement for the purpose of using such rubber cement for any of the purposes for which rubber cement may not be used under the provisions of paragraph (b) hereof; nor shall any person sell, trade, transfer or deliver, or offer to sell, trade, transfer or deliver, any rubber cement to any other person if he knows or has reason to believe such other person intends or proposes to use such rubber cement for any of the purposes prohibited by paragraph (b) hereof.

(d) *Exceptions as to supplies on hand.* Notwithstanding the restrictions imposed by paragraph (b) of this order, any person who on the date of issuance of this order had in his possession any rubber cement which he purchased or was holding for his own use for any of the purposes prohibited by paragraph (b) may use in operations prohibited by paragraph (b) hereof an amount of rubber cement not exceeding five gallons.

(e) *Miscellaneous provisions.*—(1) *Applicability of Priorities Regulations.* This order and all transactions affected thereby are subject to all applicable provisions of the Priorities Regulations of the War Production Board, as amended from time to time.

(2) *Records.* All persons affected by this order shall keep and preserve for not less than two years accurate and complete records concerning inventories, purchases, production and sales of rubber cement and the uses to which such persons put rubber cement now owned or hereafter acquired by them.

(3) *Reports.* All persons affected by this order shall execute and file with the War Production Board such reports and questionnaires as the Board shall from time to time require.

(4) *Audit and inspection.* All records required to be kept by this order shall, upon request, be submitted to audit and inspection by duly authorized representatives of the War Production Board.

(5) *Violations.* Any person who wilfully violates any provision of this order or who, in connection with this order, wilfully conceals a material fact or furnishes false information to any department or agency of the United States is guilty of a crime, and upon conviction may be punished by fine or imprisonment. In addition, any such person may be prohibited from making or obtaining further deliveries of, or from processing or using, materials under priority control and may be deprived of priorities assistance.

(6) *Appeals.* Any person affected by this order who considers that compliance with this order would work an exceptional and unreasonable hardship upon him or that it would result in a problem of unemployment in the community, or that compliance with this order would disrupt or impair a program of conversion from non-defense to defense work, may apply for relief to the War Production Board, setting forth the pertinent facts and the reasons such person considers that he is entitled to relief. The Director General for Operations may thereupon take such action as he deems appropriate.

(7) *Communications.* All communications concerning this order shall be addressed to: Rubber and Rubber Products Branch, War Production Board, Washington, D. C., Ref.: Supplementary Order M-15-f.

Issued this 31st day of July, 1942.

AMORY HOUGHTON,
Director General for Operations.

SYNTHETIC RUBBER ABSTRACTS

Although this is the largest single issue of RUBBER AGE published to date, lack of space prevents the publication of the abstracts of United States patents on the compounding and use of synthetic rubber, compiled by Frederick Marchionna, which has been running in serial form. The abstracts will be continued in the next issue.—THE EDITOR.

Editorials . . . . . .

Probing the Rubber Problem

PRESIDENT Roosevelt's announcement of a special fact-finding committee to report on the entire rubber situation, which accompanied his veto of the Gillette-Fulmer Bill, which would have authorized an independent agency to foster the production of synthetic rubber from farm products, rushed through both houses of Congress by a strong farm bloc, is welcome to both the rubber industry and the public at large, particularly the latter which is finding it exceptionally difficult to follow the charges and counter-charges and to appreciate the essential differences between the various chemical processes offered.

The rubber industry is particularly pleased with the qualifications of the committe members, these members being Bernard Baruch, chairman, James B. Conant, and Karl T. Compton. Mr. Baruch earned the respect of the rubber industry for his efficient work as chairman of the War Industries Committee in the first world war; Dr. Conant, president of Harvard University, merits his reputation as a shrewd analyst, and his comments on the rubber situation in recent months have indicated he is well aware of developments; while Dr. Compton, president of the Massachusetts Institute of Technology, is well known to rubber technologists for his great interest in the subject of rubber chemistry. It would be difficult to name a more qualified trio to handle so difficult a problem.

The committee's task, according to the President's announcement, will be to survey the existing synthetic rubber program and competing production techniques with the aim of advising the President and the War Production Board as to the most practical and efficient method of producing synthetic rubber. The magnitude of the task can be appreciated by realizing that the committee must review present and potential supply of all types of rubber and its relationship to military and essential civilian needs. It may even have to furnish a definition as to "essential civilian" needs, a point on which many executives concerned with the program are in total disagreement. Then, it is expected to recommend what steps must be taken to conserve rubber and to what extent it can be made available for essential services.

The decision must inevitably be rendered in terms of war needs and accordingly of production and priorities. It is quite possible that conclusions reached may be somewhat different than those which would be reached if time was not of the essence and copper, steel and other strategic materials presented no specific problem. Whatever the decision, since none of the committee members can be accused of having an axe to grind because of business connections, it is to be hoped that the verdict will be accepted as the final word on the complex rubber situation.

Position of Reclaim

WITH all of the furore over synthetic rubber processes the increasingly important position of reclaimed rubber seems to have been overlooked. The recent-nation-wide scrap rubber drive brought in a far greater quantity of scrap than most reclaimers estimated and the amount collected plus stock on hand at reclaiming plants, assures the continuation of reclaim production at capacity—estimated at about 350,000 tons per year—for the next two or three years, taking into consideration supplies of scrap which will become available in the future.

The scrap rubber supply is especially important today because the rubber industry now knows how much reclaim they can count on in the next few years. Rubber manufacturers, through years of handling and working with reclaim, know what they can expect from it, whereas the compounding and processing of the synthetic rubbers and of guayule will present special problems that only time alone will solve. The use of reclaim is of course controlled by the War Production Board, but it is still the "first line of defense."

CURRENT NEWS OF THE MONTH

PRESIDENT VETOES THE FARM RUBBER BILL; APPOINTS NEW FACT-FINDING COMMITTEE

AS EXPECTED, President Roosevelt, on August 6, vetoed the synthetic rubber bill, sponsored by the farm groups in the Senate and House, which would have set up a separate Rubber Supply Agency. The bill, introduced by Senators Gillette, Wheeler, Thomas, McNary and Norris, was passed by the Senate on July 22 by a voice vote with only nine of its ninety-six members present. The House passed the bill 104 to 18 on July 24, after defeating an attempt made from the floor to leave with WPB final judgment as to priorities on critical materials required for the building of plants for an increased production of synthetic rubber based on grain alcohol. In his sharp veto message the President said that the bill would block "the progress of the war production program, and therefore the war itself."

Accompanying the veto was an announcement that the President had organized a fact-finding committee to investigate the rubber situation with a view to determine the need for nation-wide gasoline rationing and other alleviative measures. It is known that the President had been considering such a move for several months and, in fact, it was erroneously reported that Chief Justice Harlan Stone had been requested to make the investigation. The Chief Justice, himself, denied the report..

Personnel of Committee

The fact-finding committee named by President Roosevelt consists of Bernard M. Baruch, chairman of the War Industries Board in the first world war, as chairman; Dr. James B. Conant, president of Harvard University; and Dr. Karl T. Compton, president of the Massachusetts Institute of Technology. This board was instructed to make "a quick but adequate survey of the entire rubber question" and is expected to render its report within the next two or three weeks.

In his veto message, the President said the farm group bill, designed to insure greater use of agricultural commodities in the production of alcohol and rubber, flew "in the face of the realities of the present grave military situation which threatens all the world and civilization itself," by giving materials for the production of rubber, even for "joy-riding," a priority over the demands of the armed services for ships, guns and ammunition.

The message made it clear that the bill had been disapproved on several grounds. As stated by the President these were:

1. It would divide priorities control of critical materials and result in "only conflict and delay" at a time when centralized control was logical and essential.

2. It would require the diversion to civilians of materials needed for the armed forces.

3. It would direct the use of millions of bushels of grain for rubber production, although the grain might, in the event of droughts, be needed for food later in the war.

4. It would require emphasis on production of rubber from agricultural products when other methods of synthetic rubber making might be found superior.

The President's message held out little hope of unlimited supplies of rubber during the war to insure new tires for all civilians. All of "the reasonable military requirements" must be met before civilian needs could even be considered, he said, and then, he went on, to give priority to "essential civilian needs," such as transporting workers to war production plants and such community necessities as delivering milk or taking children to school.

Under the Gillette bill he said that "by legislative fiat" the manufacture of synthetic rubber was ordered in quantities large enough to satisfy "any and all civilian needs" and that "absolute priority is given to obtain scarce materials for this purpose, in preference to any other military needs as scheduled by the War Production Board or called for by the armed services."

Rubber Plants Must Be Built

Production of synthetic rubber plants, he pointed out, required the use of large quantities of steel plate, other steel, copper, bronze and brass "which are sorely needed for other war purposes." But some plants must be built, he continued, because "rubber is necessary for our fighting machine and for our production machine as well."

"I am just as determined as any one to get that rubber and to get it as quickly as we can," Mr. Roosevelt said. "But it is necessary to weigh the need for factories to care for civilian luxuries against the needs of our fighting forces."

In setting up the fact-finding committee the President directed it to review the present synthetic rubber program but, at the same time, in the interests of speed, he told WPB to continue with its present production plans.

"It may well be that serious mistakes have been made in the past, based either on misinformation, misconception or even partiality to one process or another," he said. "It may be that the present program of the War Production Board is not the best solution. If so, the facts should be ascertained and made public. This is particularly so, if it be true, as charged by some persons in the Congress and outside the Congress, that the manufacture of synthetic rubber from grain has been hamstrung by selfish business interests."

Referring to the work of the committee, he said that it "would include not only facts with respect to existing supplies and estimates as to future needs, but also the question of the best method to be followed for obtaining an adequate supply of rubber for our military and essential civilian requirements. This, of course, involves a consideration of how large a quantity of critical materials needed for other war purposes can and should be used for the construction of plants for the manufacture of synthetic rubber."

Barkley Combats Legislation

The sole combatant of the Rubber Supply Agency bill when it was introduced in the Senate was Senator Barkley, majority leader. He pointed out that if the Senate and House passed the bill and the President signed it, it would divide the authority which both houses of Congress have demanded be concentrated under a single head for efficiency of the war production program. "It would be most unfortunate at this stage of the war," he said, "to divide this authority, to leave the petroleum processes of rubber manufacture with WPB and establish a separate agency, independent of WPB, to promote and handle the industrial alcohol processes." He denounced as misinformation the statement that 10,000,000 tons of scrap rubber were available if sufficient effort were made to round it up.

In urging passage of the bill, Senators Norris and Gillette reviewed extensively the testimony developed at recent investigations indicating that the agricul-

tural process was cheaper, faster and required fewer critical materials. To employ agricultural products in the synthetic rubber program, Senator Norris maintained, would be to contribute to the permanent solution of the continuing problem of farm surpluses. Rather than draining off natural resources, as in the preferred use of petroleum, he held, agricultural resources could be conserved.

President Roosevelt took note of this situation in his veto message, but stated that "there is a steadily increasing demand for grain for the making of food for the Army and Navy and Air Force —not only of the United States, but of all the United Nations." Although we now have great grain reserves, he said, in the event of a serious drouth like those of 1934 and 1936 our reserves of grain may not be sufficient to cover requirements both for food and for unlimited alcohol and rubber. This situation must be considered by those charged with the over-all possibility of the entire war production effort, he stated.

Nelson Voices Strenuous Objection

Strenuous objection to the bill was voiced by Donald Nelson, chairman of WPB, in testimony before the Senate agricultural subcommittee on July 14. Mr. Nelson flatly told the subcommittee that WPB had ruled out any shifts now in apportionment of Buna rubber manufacture among alcohol, benzene and petroleum processes, but added that if the synthetic rubber program is expanded, new processes may share. He admitted that "calm reflection" later might reveal some mistakes made in the program because of the "sheer force of need for speedy and decisive action." Mr. Nelson also made the following statements:

"Since my last appearance before your subcommittee the newly created Combined Production and Resources Board has initiated a joint inquiry with the British representative into the requirements of the major rubber-consuming items of war equipment. Also since my appearance before your subcommittee last week, the War Production Board at my request again reviewed the status and progress of the synthetic rubber program. Detailed reports of construction progress and estimated production were received. The present balance of processes and raw materials, with respect to petroleum and alcohol sources, was weighed.

"The question for consideration was whether the program for the production of Buna S, which comprises 700,000 tons of the total program of 800,000 tons, should proceed upon the presently authorized proportions of alcohol, petroleum and benzene. It was agreed that the Buna S program should proceed upon its present basis, including 200,000 tons from alcohol, 20,000 tons from benzene, and the balance from petroleum.

"That decision of the board to proceed under present plans with all possible speed, does not exclude encouragement of any assistance to continued technological developments still ahead in the entire field of synthetic rubber. I am particularly interested in and I have given all the encouragement I can to the development of the butylene-glycol process now under test by the Northern Research Laboratories at Peoria, Illinois.

"I have followed very closely and have been in touch with the parties interested in the development of the so-called Polish process which is being sponsored by Publicker Corporation. The Publicker Corporation was granted an A-1-b priority rating on March 31, which was moved up to an A-1-a rating on June 27 for materials necessary to build a 2,000 pound per day pilot plant for the continued testing and development of that process."

(EDITOR'S NOTE: Very little has been heard about the Publicker process in the past several weeks, ever since the pilot plant was visited by a group of Congressmen and representatives of various government agencies concerned with the rubber program. It is known, however, that experiments are still being conducted and the company is still urging adoption of its process by WPB).

Mr. Nelson also submitted estimates as to synthetic rubber production based on the government program for 1942 and 1943. These are summed up in the following table:

(Long tons)

	1942		
	Actual 1st half	Objective 2d half	Total
Buna S	1,000	7,000	8,000
Butyl	....	300	300
Neoprene	3,600	8,400	12,000
Buna N and Thiokol	4,800	7,200	12,000
Total	9,400	22,900	32,300

	1943		
	1st half	2d half	Total
Buna S	54,600	226,400	281,000
Butyl	1,700	19,300	21,000
Neoprene	9,500	11,500	21,000
Buna N and Thiokol	7,500	7,500	15,000
Total	73,300	264,700	338,000

Thomas in the Detroit News

"Chemistry and Politics"

Later it was learned that Mr. Nelson has assumed personal direction of the government's synthetic rubber program. Although it could not be confirmed, it was understood that Mr. Nelson and Arthur Newhall, Rubber Coordinator, have decided upon a drive to end sniping at WPB's synthetic rubber plans. It was emphasized that the WPB chairman has not displaced Mr. Newhall and has no intention of doing so. They declared that Mr. Nelson merely is placing the accent on speed and is maintaining a close personal touch with all latest developments.

Veto May Be Fought

Although prior to the actual veto of the farm rubber bill, known as the Gillette-Fulmer Bill (Representative Fulmer, of South Carolina, introduced the bill to the House), the farm bloc threatened to override it in both the Senate and House by a substantial majority, the announcement of the appointment of the Baruch committee which accompanied the veto softened the threat somewhat. Stating that he was pleased with the committee, Senator Gillette said: "We are interested in results. If this committee recommends that all sources of raw materials be used in making synthetic rubber, and if its recommendations are carried out, there will be no further action."

Several Congressmen, however, expressed complete disapproval of the message accompanying the veto. They claim the President has too casually accepted the estimates of WPB and the military services of the need for rubber. There is considerable argument as to the proper definition of "essential services."

These Congressmen claim the President is misinformed about priorities for materials to build rubber plants. The President said, regarding this, that the Rubber Reserve Company chairman is given power to "obtain any necessary materials, and is given priority for them over all other private plants engaged now or later in making implements of war." Materials for construction of rubber plants are not getting such priorities, it is said.

The President's statement that plants are being built to make alcohol from grain, and that almost 100,000,000 bushels of grain will be required to meet the current needs of the rubber-from-grains allocation, is misleading, Congressmen claim. The only plant authorized to produce rubber from grain alcohol, they explained, is that of Carbide & Carbon Chemicals Corporation, and only 70,000,000 bushels of grain are scheduled for its program.

Furthermore, it is explained, this is not a real rubber-from-grains factory. What Congress voted for it is said, are plants located in the grain belts to produce rubber from the grain right on the spot, and not to produce rubber from alcohol processed from grains transported thousands of miles to the country's distilleries.

DEVELOPMENTS IN THE SYNTHETIC RUBBER SITUATION

Of special importance to the overall synthetic rubber program during the past month, was the announcement made by Standard Oil (N. J.) on July 23 that through an improvement in the manufacturing process that company has been able to increase the capacity of plants for making Butyl rubber to 132,000 tons annually from the 60,000 tons originally planned. The increase can be made without adding to the cost of construction of the plants or delaying their completion. The program has been approved by WPB which, on July 27, officially announced that the synthetic rubber program has been increased from 800,000 to 870,000 tons.

Carbon Black Acts As Absorbent

Prior to the announcement of the improved process, which includes the addition of carbon black in the manufacturing stage before the addition of the catalyst, the carbon black acting as an absorbent rather than as a dispersing agent, the five Butyl plants under construction by the Standard Oil Co. of Louisiana and the Humble Oil and Refining Co. had an original designed capacity of 60,000 tons. The improvements made it possible to raise the capacity to 192,000 tons per year at an estimated additional investment of approximately 27%.

The new program calls for the cancellation of one of the five plants and the use of the materials and money thus saved to increase the capacity of the remaining four plants, three to be operated by Standard Oil (Louisiana) and one by Humble Oil, to 132,000 tons per year. At the same time the raw material (isobutylene) preparation capacity is raised from 60,000 tons to 90,000 tons per year. These increases, it was emphasized, as nearly as can be determined, are possible at no net increase in cost or increased use of construction materials.

According to Mr. Farish, president of Standard Oil (N. J.), who announced the improved process, it is believed that the additional 42,000 tons of isobutylene required to take advantage of the full potential Butyl rubber capacity can be obtained by the government without appreciable expense from other plants being built by it in the vicinity. Isobutylene, it will be remembered, is a common refinery by-product and unlike butadiene cannot be produced practically from grain or other raw materials.

At the same time Mr. Farish gave some further information on Flexon, the Butyl-like material, the production of which he first revealed in a statement before the House Subcommittee of Mines on July 15. According to Mr. Farish, because the production of Butyl rubber calls for a temperature of 150° F. below zero that material cannot be manufactured until completely new equipment is available. However, by using make-shift equipment and utilizing ordinary dry ice as a refrigerant it is possible to produce Flexon. Accordingly, the production of Flexon, best described as an inferior grade of rubber-like product of the general nature of Butyl, is limited only by the amount of dry ice available, which is believed to be considerable.

The Flexon process, it was pointed out, also requires additional quantities of isobutylene, and while there is still some question as to how much can be obtained without building new plants, it is believed that isobutylene supplies will be available for both the increased production of Butyl and new production of Flexon. Samples of Flexon are now in the hands of several rubber manufacturers and further information concerning its properties may be expected shortly. At this writing (August 13) it has not yet been determined what part Flexon will play in the government overall synthetic rubber program. It may be manufactured under Rubber Reserve supervision and sold exclusively to that agency or it is possible that the rubber manufacturers may be permitted to contract for supplies of Flexon with the oil companies making it.

Incidentally, the improvements in the Butyl rubber process are expected to reduce plant investment per ton of annual capacity from $750 to $350 and make an approximate reduction of 5 cents per pound in the cost of making Butyl. In announcing the revised goal of 870,000 tons for the synthetic rubber program, WPB declared that the expansion was not expected to alter the anticipated production of 300 tons of Butyl rubber this year. The first Butyl plant is expected to be in operation by December 1 and the remaining plants by next July.

Discusses "Quick-Butadiene" Process

In his report before the House mining committee, Mr. Farish also revealed plans for a "quick-butadiene" process. Referring to the fact that the production of butadiene is the bottleneck of the Buna program, he said that if more butadiene could be produced quickly the entire program could be speeded up by several months. A definite campaign to work this out was developed by the Office of the Petroleum Coordinator, Mr. Farish stated, and a special committee on synthetic rubber appointed by the Petroleum War Council.

As a result of this campaign, butadiene from petroleum will be produced in make-shift facilities by various oil companies. This production is entirely outside of the government program, according to Mr. Farish, and does not involve building new plants. He pointed out, however, that there will be some expense involved in "throwing together" the make-shift equipment; that the operations will be inefficient; and that the butadiene will cost more than when made in properly designed plants. Standard Oil alone, he said, will be able to make between 15,000 and 30,000 tons of butadiene in make-shift facilities by the first of the year.

According to estimates made by Standard Oil, revealed by Mr. Farish in his report, the raw materials for the 700,000 tons of Buna S in the government program will be derived from agriculture, mining and petroleum in about the following proportions:

Agriculture: $81,900,000 worth of grain for production of 210,000 tons of butadiene and for a portion of raw materials for styrene.

Coal Industry: $9,900,000 worth of benzol for most of the raw material for styrene and a small amount of butadiene.

Petroleum Industry: $22,300,000 worth of refinery gases for 325,000 tons of butadiene and some of the raw material for styrene.

HOUDRY PROCESS

The battle for the adoption of the Houdry process in the production of butadiene from petroleum is still being maintained by the Houdry Process Corp., of Philadelphia. Eugene Houdry, head of the concern, it will be recalled, claims that his process will produce butadiene at a cost of only 7 to 7½ cents a pound compared with 10 to 15 cents a pound for other petroleum processes.

In testimony on July 13 before the Senate agricultural subcommittee, headed by Senator Gillette, Clarence H. Thayer, engineering consultant of the Houdry Process Corp. and chief engineer of the Sun Oil Co., one of the backers of the Houdry concern and licensed under its patents, claimed that it is possible to obtain higher yields at lower temperatures than by any other process which produces butadiene from petroleum.

Present petroleum processes for making butadiene, Mr. Thayer said, require five separate steps and could not possibly be put into operation in less than 13 months, while the Houdry method required only two steps and could be in full production in 9 months or less.

"In the gasoline cracking process," he said, "the heat developed by burning the deposit off the catalyst during the regeneration step is greater than the amount required to perform the cracking reaction, and thus the extreme heat must be removed from the catalyst by means of tubes containing a circulation cooling media. In the Houdry butadiene process the pressure conditions are adjusted so as to balance the heat requirements for reaction with the heat produced by the regeneration step. The simplicity of this operation is exclusive with the Houdry butadiene process.

"The process which has been ordered by Rubber Reserve Corporation to be put in general use for the petroleum

rubber program supplies the heat required for the reaction by means of very large quantities of steam which is heated to a temperature of 1,400 degrees Fahrenheit and which is mixed with the feed stock."

Referring to constructional costs, Mr. Thayer testified that a plant to produce 50,000 tons of butadiene from alcohol would require 7,000 tons of steel, as an example, as compared with less than 5,000 tons required for a Houdry plant of the same capacity for the production of the material from petroleum. The committee counsel, however, challenged the alcohol-butadiene figure, stating that it was placed in the records by E. R. Weidlein, technical consultant to Rubber Reserve, but that other testimony has been presented to the effect that a 50,000-ton plant for producing butadiene from alcohol would take 3,300 tons of steel only.

Pew Makes New Charges

Following Mr. Thayer to the stand, Arthur E. Pew, Jr., vice-president of the Sun Oil Co., testified that Rubber Reserve had rejected the Houdry process on the ground that it was insufficiently developed. This he emphatically denied, adding that while Sun Oil was unable to get a "fair and impartial hearing," Rubber Reserve had requested the Phillips Petroleum Co. "to immediately investigate" the process before proceeding further with a 45,000-ton butadiene unit now under construction at Borger, Texas.

Later, in a letter to Senator Gillette, made public on August 2, Mr. Pew charged that a tabulation presented to the Senate committee by officials of Rubber Reserve "distorted" the true facts concerning requirements for critical materials of the Houdry process. The tabulation showed critical materials required for construction of a plant using the Houdry process and a competing process submitted to the subcommittee by P. C. Keith of the M. W. Kellogg Co.

The comparison submitted by Mr. Keith, according to Mr. Pew, who described the former as an adviser to Michael J. Madigan, in charge of synthetic rubber plant construction for Rubber Reserve, was inaccurate "since he (Mr. Keith) undertook to compare material requirements for a complete plant using the Houdry process with material requirements for a part of a plant using a competitive process."

Still later, on August 4, Mr. Pew told a House committee, headed by Representative Fitzgerald, that Rubber Reserve was hindering production of butadiene and that the Houdry process had been "turned down" despite the fact that it is a faster method and requires substantially less critical materials. Mr. Pew said that the Houdry Process Corp. has offered the process to other firms, on any terms the government desired, and that several oil companies would probably adopt it if permitted to do so by Rubber Reserve. He estimated that if the Houdry system was adopted sufficient butadiene capacity could be reached in nine months for the production of 800,000 tons of synthetic rubber.

The *New York Daily News* published a report on August 2 to the effect that an agreement had been reached between Rubber Reserve and the Houdry Process Corp. According to this report, the agreement was supposed to have called for the production of 600,000 tons of synthetic rubber based on butadiene made from the Houdry process at a cost of only 5 cents for the butadiene. In denying the report, Jesse Jones, head of the RFC and chairman of Rubber Reserve, said: "There is not a semblance of truth in this report. It is ridiculous both as to quantity and as to price."

The report, which was also denied by Mr. Pew, is believed to have grown from the recent announcement by Secretary Ickes, petroleum coordinator, that oil refineries throughout the country would be employed, with a minimum of machinery conversion, in producing butadiene, as reported elsewhere in this issue.

RUBBER FROM GRAIN

A new and greatly improved continuous process for producing butadiene has been developed by Joseph E. Seagram & Sons, Inc., according to an announcement made at Louisville, Ky., on July 14 by H. F. Willkie, vice-president in charge of production. In contrast to other grain processes that first produce ethyl alcohol and then butadiene, the new process converts the grain into 2:3 butylene glycol from which butadiene is easily made.

The new process, Mr. Willkie said, will produce about eight pounds of rubber for each bushel of grain, compared to an average of six pounds for other methods. Cost has already been reduced below twenty cents a pound for the finished rubber, and further refinements are expected within a short time to reduce the cost to as low as fifteen cents. Less equipment is needed than for any previously known commercial process for making synthetic rubber, Mr. Willkie said, and a better quality of butadiene results.

Last spring the Seagram company discovered that the Northern Regional Research Laboratory of the United States Department of Agriculture at Peoria, Ill., and that Iowa State College had done basic research on this process. With the full cooperation of the National Regional Research Laboratory, the Seagram company outlined plans for a quarter-million-dollar pilot plant, and told WPB that it would erect such a plant to develop the process further from an engineering standpoint. Since then, a method was found to use a small pilot plant that the company already had in Lawrenceburg, Indiana; and in consequence, several months' time has been saved.

The next step in making large supplies of synthetic rubber by the new process is the erection of a plant capable of processing 55,000 bushels of grain a day. Blueprints for such a plant have been completed by Seagram engineers, and construction could start at once, Mr. Willkie said, and only a comparatively small amount of critical material would be needed.

Credit for devising and developing the butylene glycol process was given by Mr. Willkie to these members of the Seagram research laboratories: Dr. Paul J. Kolachov, Director; Dr. W. H. Stark, and E. D. Unger, and to the company's technical staff. Mr. Willkie also acknowledged the helpful collaboration of the Vulcan Copper and Supply Company, of the B. F. Goodrich Company, and of Dr. D. B. Keyes of the University of Illinois.

Announce Government Process

A short and economical process for making butylene glycol, believed to be somewhat similar to the Seagram process, was announced on July 20 by the Department of Agriculture. The new method, being developed at the Department's Northern Regional Research Laboratory, at Peoria, Ill., involves the fermentation of plentiful farm crops, such as corn and wheat. The laboratory is now producing butylene glycol on a pilot plant scale. It may be used in making anti-freeze and in the production of commercial solvents.

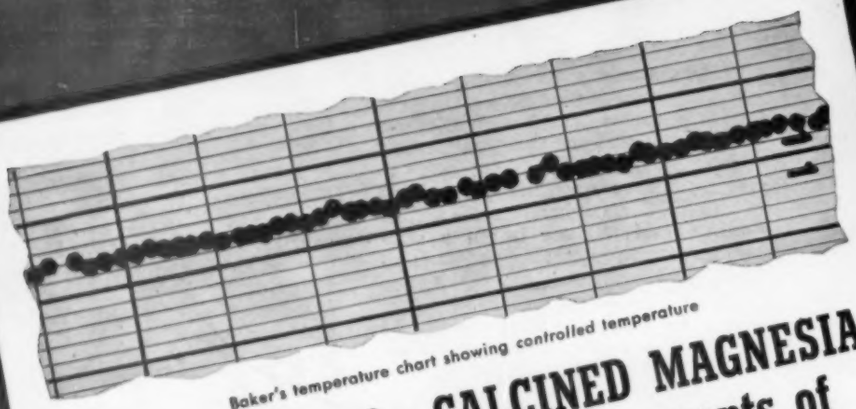
The announcement stated that the laboratory is also studying butylene glycol as a possible link in the production of butadiene. Considerable interest has been shown by industry in the fermentation process for producing the material, and the major problem remaining is the conversion of it to butadiene on a commercial scale. Chemists at the laboratory, it was said, have succeeded in producing excellent yields of pure butadiene from corn-made butylene glycol, but they have not yet developed the process to a pilot plant scale.

The method developed by the Peoria laboratory of making butadiene from butylene glycol was demonstrated to more than sixty scientists at the laboratory on August 5. Briefly, the method consists of treating the butylene glycol with acetic acid, the resulting liquid then being forced through a hot tube and the acid drawn off leaving butadiene. At the demonstration it was reported that laboratory chemists have succeeded in producing about 7½ pounds of butadiene from a bushel of corn via the butylene glycol process.

Supplies Declared Plentiful

Conversion of the alcohol beverage industry to war production has provided more alcohol for making butadiene than plants presently planned, according to a statement made on July 15 by Frazier Moffatt, Jr., who re-

MORE NEOPRENE TO BE USED!



Baker's temperature chart showing controlled temperature

How Baker's CALCINED MAGNESIA meets the exacting requirements of NEOPRENE COMPOUNDERS

Special, custom-built electric ovens manufacture Baker's light Calcined Magnesia. This electric-controlled Calcining Process gives definite uniformity and eliminates possibility of oxide contamination from products of combustion. The temperature chart above shows the unvarying temperature (never more than 5° variation) in these special ovens. This controlled temperature is a major reason for these features of Baker's Calcined Magnesia—so essential to Neoprene compounding:

1. *Uniformly* GOOD WETTING POWER OR EASE OF INCORPORATION.
2. *Uniform* DISPERSION with IMPROVED STABILIZING EFFECT.
3. *Uniform* QUALITY—that is maintained in MOISTURE-PROOF PACKAGING.

Baker's *Light* CALCINED MAGNESIA

(MAGNESIUM OXIDE)

TEST IT YOURSELF! COMPARE!

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In the past few months, the demands for Neoprene compounded products have multiplied! As time goes on—these demands will be even greater.

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A *uniform* Calcined Magnesia that is *always available* means much to smoother, faster compounding.

Baker offers you such a Calcined Magnesia. From the brine wells right on through to controlled temperatures, so essential to uniformity—Baker's Calcined Magnesia is manufactured especially to meet the exacting needs of Neoprene compounders. Test it in ease of dispersion — stability of compounded stock—rate of cure—tensile strength and plasticity! It meets your needs completely!

And remember—Baker safeguards delivery of *uniform* Calcined Magnesia. Moisture-proof packages bring you this product with its *uniform* quality maintained. Send today for free samples.

and MAGNESIUM CARBONATE, too

The Rubber Industry, too, will be interested in Baker's Magnesium Carbonate with reinforcing qualities resulting in high tensile strength, set, abrasion resistance, etc.

Baker's Magnesium Carbonate is uniformly clean—manufactured to rigid specifications, both chemical and physical. Needle type crystal gives definite control for reinforcing characteristics. Production is continuous, assuring users of closely regulated uniformity. Send for free samples.

J. T. BAKER CHEMICAL CO., *Phillipsburg, N. J.*

Cartons are corrugated, tough, waterproof! All edges are taped—providing complete protection against moisture!

Strong 4-ply bags are asphalt-interlined and tape-sealed—a further barrier against moisture infiltration!

SEND FOR FREE SAMPLES---TODAY!

cently resigned as chief of the alcohol and solvents section of WPB to enter the Chemical Warfare Service as a Lieutenant-Colonel. Mr. Moffatt said that WPB had offered to divert 200,000,000 gallons of alcohol to Rubber Reserve during 1943 for the production of butadiene, but that the latter agency reported that actual consumption next year would call for only 110,000,000 to 125,000,000 gallons.

On July 28, Frederic C. Walcott, former president of the Dunlop Tire & Rubber Corp., and a former Senator from Connecticut, told the Senate agricultural subcommittee that stocks of wheat owned by the Commodity Credit Corp. could be used to make a large supply of butadiene but that in his opinion the cost would be almost twice as much as the production of that material from petroleum. Mr. Walcott also urged the appointment of a special scientific committee to speed the synthetic rubber program.

Although the testimony given before the subcommittee last month by Michael J. Madigan, technical consultant to Rubber Reserve, was heard behind closed doors, according to reports from Washington he testified that the rubber-from-grains or Polish process of the Publicker Commercial Alcohol Co., of Philadelphia, was practicable and might easily be placed on a commercial basis. Mr. Madigan is in charge of synthetic rubber plant production for Rubber Reserve.

THIOKOL N

Because there has been so much confusion surrounding the development of Thiokol N, the new type Thiokol which has been found suitable for tire recapping purposes, the Thiokol Corporation, for which the Dow Chemical Co. manufactures its synthetic rubber, although Thiokol itself produces some Thiokol latexes at Trenton, explained the full situation as it existed in mid-July in the August issue of *Thiokol Facts*, the house organ issued by the company. The following explanation is taken from that issue:

The development of Thiokol N goes back to 1940 when the Thiokol Corp. was conducting an investigation for an automobile manufacturer who had requested a Thiokol compound having specific performance advantages. The basic formula for Thiokol N was determined at that time, but although the material was appraised for various applications it was not appraised for retreads.

Prior to Pearl Harbor, the Thiokol Corp. began the investigation of existing types of Thiokol to determine their value as substitute materials for natural and reclaimed rubber. This investigation was intensified after January, 1942, when tire rationing went into effect. During this period, or shortly thereafter, a committee of experts in the rubber, automobile and chemical fields, headed by James Zeder, of the Chrysler Laboratories, was set up in Detroit to study the rubber situation with the hope of making recommendations to the government covering a substitute for crude rubber and tires.

After hearing various testimony, the committee reached the opinion that Thiokol N offered the easiest and fastest means of placing in the hands of the rubber and automotive industries synthetic rubber in quantities that would ease the shortage materially. Two major factors influenced the committee, the first being the experimental work that had already been conducted by Goodyear and the second is the comparative ease of building new plants to produce Thiokol and the abundance of the raw materials from which this synthetic is made. Before this decision was reached, several of the rubber manufacturers represented on the committee conducted their own experiments to substantiate the data presented by Goodyear. Full cooperation on pooling all information on Thiokol—from users and manufacturer—was achieved.

The four basic materials required to produce Thiokol are caustic soda, chlorine, sulfur and ethylene. The first two are readily derived from common salt. Sulfur is so plentiful it is not even on a priority basis. A lack of ethylene, reported to the committee, provided the only raw material problem. However, it was decided that if Thiokol N provided even a good partial answer to the tire problem the lack of ethylene could be repaired by additional production and that this additional production could be obtained within a period that would not unduly delay attainment of the committee's broad objective.

The 30,000-ton rate per year which has been publicized in the press as being the amount of Thiokol to retread 12,000,000 tires calls for a productive rate of 2,500 tons per month. This production will not, in all probability, be reached until the beginning of 1943. However, there will be some production starting August 1, gradually increasing to the 2,500-ton-per-month rate. This production will be attained in a pilot plant which should produce 125 tons during the month of August. Five tons per month has been produced in a test plant which heretofore has been supplying only enough rubber for testing and analysis.

Ford Offers Plan

Of interest during the past month was the plan presented to WPB by the Ford Motor Co. under which the new Thiokol N would be used to keep the automobiles of war workers on the road. The plan, according to Charles E. Sorensen, vice-president and general manager, was designed to solve the problem of essential transportation for Ford workers and would be offered to the entire United States war industry if approved.

Ford engineers, it was said, have developed a system for handling "all essential retreading and tire replacement for the autos, buses and trucks required as transportation for upward of 200,000 Ford employees." Two pounds of Thiokol N, it was reported, would permit a retread of "one-tenth inch skid thickness, good for 4,000 to 5,000 miles of moderate driving."

The Ford proposal included an offer to do all of the manufacturing and application of the essential retreads in the Ford tire plant in Dearborn. It contemplates a continuous inspection of employee cars and the application of retreads at the first sign of fabric in worn parts. The retreads would be sold to the employees at nominal cost. No comment was forthcoming from WPB.

STYRENE PROCESS

A new process for producing ethyl benzene, an intermediate in the production of styrene, used with butadiene to form Buna S, which can be employed to substantially speed up the synthetic rubber program was announced by the Atlantic Refining Co., of Philadelphia, on July 27. Styrene is manufactured from ethyl benzene by a dehydrogenation process.

The new process, according to Robert H. Colley, president of Atlantic Refining, would so greatly speed up the production of ethyl benzene that the construction of expensive plants would be unnecessary. It would substitute ethyl alcohol and phosphoric acid, nonstrategic raw materials, for ethylene and aluminum chloride, both strategic materials, in the production of ethyl benzene. The process costs approximately 5% more than prevailing methods.

The Atlantic process has been offered to the government for incorporation in the synthetic rubber program, the proposal being made through the Technical Advisory Committee of the Synthetic Rubber Committee of the Petroleum Industry War Council. At the same time, Atlantic Refining, which has already applied for patents, has advised Rubber Reserve that it is ready to grant a royalty-free license for the duration of the emergency on any patents that may be issued to any manufacturer desiring to use the process in the government program.

Production of Styrene for the synthetic rubber program is soon to be started by at least two companies, Monsanto Chemical and Dow Chemical. According to technicians in charge of the program for Rubber Reserve, supplies of styrene will prove sufficient for synthetic rubber manufacture this year and next. Severe restrictions already exist on the use of benzol and styrene, through Conservation Order M-137 and General Preference Order M-170, respectively. The styrene plant to be built in Texas by Dow Chemical will be located at Velasco rather than at Port Neches as originally planned.

A report is also current that the Hou-

dry Process Corporation is working on a new process for the production of styrene. Houdry technologists, working on the development, expect to have it commercially feasible by the end of the year.

BUTADIENE

On July 30 Secretary of Interior Harold Ickes, who is also Petroleum Coordinator, announced that the oil industry could produce sufficient additional butadiene to make 250,000 tons of synthetic rubber a year. This production would be in addition to the 870,000 tons covered in the present government synthetic rubber program.

According to Mr. Ickes, a survey of the oil industry, conducted by Wright R. Gary, director of refining in the Office of the Petroleum Coordinator, revealed that the industry could produce 200,000 tons of butadiene a year using equipment 90% of which would be second-hand. Approximately 75% of the oil industry could participate in such a program, it was said, and about 30 "nucleus" plants are being prepared.

Commenting on the announcement, Rubber Coordinator Arthur Newhall said that the increase had been anticipated and already had been figured in the 870,000 ton synthetic rubber goal set by WPB. He added that the additional butadiene would be a "marvelous development" and would "virtually assure" accomplishment of the synthetic rubber program. The additional butadiene, he also stated, would speed up the entire program and may permit the production of over 400,000 tons of Buna S in 1943 instead of the approximate 300,000 tons previously estimated by various government officials.

It is also possible, Mr. Newhall said, that if the refining industry can continue turning out large supplies of butadiene from existing plants indefinitely metals and machinery may be diverted from the butadiene phase of the government construction program on synthetic rubber to some other phase—to increase polymerization capacity or to increase the capacity for producing Thiokol or Butyl. This would allow an increase in the present 870,000-ton program.

GENERAL ACTIVITIES AT WASHINGTON ON RUBBER SITUATION

Although sufficient rubber will be produced in 1942 and 1943 to meet the essential requirements of the armed forces and the war workers of the nation, no one should use his automobile for unnecessary travel, Jesse Jones, Secretary of Commerce and head of the RFC, told the Senate Banking and Currency Committee on July 15. Everything is being done by government officials that can be done to relieve the rubber situation at the earliest possible time, he said.

The entire rubber program, Mr. Jones told the committee, is a matter of continuing cooperation between the War Production Board, Army, Navy, Army and Navy Munitions Board, Office of Petroleum Coordinator, the Department of Agriculture and the Rubber Reserve Co. A standing committee representing these agencies has adopted a definite program on synthetic rubber calling for the production of 800,000 tons a year (since raised to 870,000 tons), of which 220,000 tons are to be made from alcohol, 20,000 tons from benzol, and the balance from petroleum fractions. Forty-one rubber, oil, alcohol and chemical companies are already participating in the program.

New formulas and processes are advanced almost daily by people anxious to help, Mr. Jones stated, or by others who are interested in making money by having the government adopt their processes and give them a contract. "We could never get any considerable synthetic rubber if we jumped from one process to another every time an oil company or alcohol company or an inventor, however patriotic either may be, wanted the government to adopt their process," said Mr. Jones. "We are following what we believe to be the best technical advice."

Special Committee Appointed

Announcement was made on July 19 that WPB had appointed a special committee consisting of twelve outstanding chemists and engineers to advise it on the merit of new chemical processes related to the war effort. In announcing the creation of what he termed a chemical "Supreme Court," Dr. E. W. Reid, chief of the WPB chemicals branch indicated that it would not act as a research unit but rather it will pass on the relative methods of competing chemical processes when asked to do so by WPB. The crux of its deliberations will rest on two points: (1) Which process can be placed in production most quickly, and (2) Which uses the smallest quantity of critical materials.

The new advisory committee is headed by Dr. Donald B. Keyes, head consultant of the chemical branch and professor of chemical engineering at the University of Illinois. Dr. Frank C. Whitmore, dean of the School of Chemistry and Physics of Pennsylvania State College, is also a member as are Foster D. Snell and Gustavus J. Esselen, both well-known industrial consulting technologists.

It was believed that conflicting testimony in regard to chemical processes involved in the manufacture of synthetic rubber probably had as much to do with WPB's decision to organize the special committee as any other single factor. It was pointed out that virtually the whole burden of weighing these processes devolved on E. R. Weidlein, technical consultant to Rubber Reserve, who is "terribly overworked." There was little doubt that the committee would tackle the synthetic rubber problem as one of its first assignments.

New "Conspiracy" Charge

A "conspiracy" to limit production of synthetic rubber, sponsored by oil men in and out of the government, was charged before the Senate Patents Committee on August 5 by C. A. Starnes, of Gladewater, Texas, an independent oil operator. He contended that the "conspiracy to prevent the free development of synthetic rubber is managed by international cartels and patent pools." He added that he had learned of the "conspiracy" in the past six months during which time he had attempted to put six refineries into production of synthetic rubber and other products.

Purpose of the limitation of the synthetic rubber program, according to Mr. Starnes, is to establish and maintain a monopoly in the United States and in the world and to "drive out competition which might survive after the war." He said tactics of the oil group obstructing production consisted of limiting production of raw materials and withholding technical information from independent oil operators.

W. S. Farish, president of Standard Oil (N.J.), denied these latest charges in a telegram to Senator Bone, chairman of the patents committee, on August 7. He termed the testimony "wild and scurrilous".

Mr. Farish contradicted Mr. Starnes' assertions that Standard denied him a license to manufacture rubber or withheld information on the manufacture of Butyl rubber or Flexon. Mr. Starnes applied to Standard for information on the manufacture of Butyl July 6, Mr. Farish said, and Standard on July 8 sent him all the information it could without violation of Government secrecy orders.

"At the same time," Mr. Farish told Senator Bone, "we offered him an emergency form of license, as this was exactly what he asked for. Although we sent him a free license, in accordance with our public offer of March 10, 1942, Mr. Starnes has been objecting for the last three weeks to the form and scope of this license. Typical of his attitude was his complaint that the license offered was limited to the United States, its territories and possessions."

New Investigating Committee

Still another committee has been created by a Congressional group to "dispel the confusion" surrounding gasoline, fuel oil and synthetic rubber programs. A 10-member bi-partisan House committee was created on July 21 at the urging of Representative Fred A. Hart-

ley, Jr., of New Jersey, headed by Representative Fitzgerald, of Connecticut, as chairman. Mr. Hartley explained the committee was "unofficial" but stated that he expected it would be able to unravel some of the confusion of conflicting statements and proposed remedies. This committee has already heard several witnesses, as reported elsewhere in this issue.

On August 4, in a radio address over the NBC Blue Network, Representative Hartley launched a vicious attack on the handling of the synthetic rubber program to date. He specifically charged that the program, under the direction of the Rubber Reserve Co., has been seriously delayed because of incompetence and mismanagement in the government agencies concerned, failure of the various agencies to work in cooperation and harmony with each other, the struggle by the various selfish interests to control the synthetic rubber industry, and favoritism toward a select group of companies to the exclusion of all others.

As a solution to the problem, Mr. Hartley suggested that "we obtain an unbiased appraisal of all the various processes for the manufacture of synthetic rubber by thoroughly competent scientists who have no axe to grind and no interests to serve other than the broad national interests," and suggested that Frank Jewett, president of the National Academy of Scientists, be asked to conduct a scientific and technical study to determine which is the best process "from the standpoint of speed, quality, cost and use of strategic materials."

Somers Concludes Investigation

It is also reported from Washington that the House Committee on Coinage, Weights and Measures, of which Andrew L. Somers is chairman and for which Elliot Simpson has been acting as nonsalaried counsel, has concluded its investigation of the rubber situation. In winding up the committee's investigation, Mr. Somers is understood to have praised Mr. Simpson and to have recommended that a special committee be appointed to restudy the situation.

It is also understood that Mr. Somers' decision was somewhat hastened by a letter received from John J. Cochran, chairman of the House Committee of Accounts, notifying him that committees may not retain counsel, even without pay, unless specifically authorized to do so by the House. Accordingly, Mr. Somers, reports the *New York World Telegram*, would have had to ask House permission or fire Mr. Simpson.

His dismissal as counsel of the House committee, however, has in no way stopped the flow of publicity material which Mr. Simpson has been issuing of late. As far as can be determined, he still employs a publicity agent and his publicity releases still continue to carry lurid charges against the present operation of the rubber program.

Set Prices on Rubber Heels

Maximum prices that shoe repairmen may charge for rubber heels, attached to the shoe, are contained in Maximum Price Regulation 200, issued by OPA on August 10. All grades of rubber heels, top-lifts, and heel bases used in shoe repairs—lines formerly manufactured as well as the new Victory heels made according to WPB specifications—are covered by the order which sets the maximums to be charged by manufacturers, jobbers and shoe repairmen.

The maximum prices for men's attached half heels range between 55 cents and 40 cents a pair, depending on grade, and women's cuban heels between 40 and 30 cents. Ceilings for women's top-lifts run from 30 cents down to 20 cents, depending on the type used in making the repair, with an additional 10-cent charge permitted if repairs to the heel base are made. The maximum applied prices for men's full heels range from 65 cents for corded heels down to 45 cents for the "special competitive grade."

Repairmen are required to post their maximum prices for all shoe repairs in which they use any of the rubber products listed in the maximum price schedule. The new Victory heels and lifts produced after this regulation goes into effect are to be marked according to grade, so that the buyer can tell readily whether the price asked for the grade used is a proper one. There are four grades in the Victory line, V-1, V-2, V-3, and V-4, with quality determined by wear tests.

Heels manufactured before W. P. B. restricted the kinds of reclaimed rubber that may be used as an ingredient, also are under the ceiling, but in their case the brand name indicates the quality and is the price determining factor.

Dissolve Machinery Branch

The Special Industrial Machinery Branch of WPB was dissolved by administrative order on July 15. Operations of this branch have been tied in closely with other WPB branches and it was believed that more efficient administration could be achieved by delegating this work to the branches most concerned with it. Orders originating in the special branch will be administered in the future by other WPB branches. Order L-143, dealing with tire machinery and equipment will be administered by the Rubber and Rubber Products Branch.

Order L-143, incidentally, which specifically prohibits production and delivery of tire manufacturing machinery and equipment without specific authorization by WPB, originally was to have become effective on July 19. Under the terms of Amendment No. 1, issued on July 23, however, the effective date was changed to August 3. The change was necessary because of delays in the preparation of necessary forms and administrative procedure.

AMENDMENTS AND ADDITIONS TO SUPPLEMENTARY ORDERS

Three amendments to Supplementary Order M-15-b have been issued since our last issue. These refer to balata, scrap rubber and reclaim, particularly, as follows:

Amendment No. 11, issued by WPB on July 25, prohibits the sale or transfer of balata except under regulations prescribed by government agencies and bans its use except for purposes authorized by WPB. Balata, formerly used in the manufacture of golf balls, belting, shoes, hats and waterproof cable is now needed for the production of self-sealing tanks and other military items.

Under the terms of the order, the use of balata is specifically restricted to (1) the manufacture of self-sealing fuel cells to fill any war order, or (2) for any other purpose for which special authorization may be issued by the Director General for Operations. The amendment also changes the title of Order M-15-b to include balata and balata products as well as rubber and rubber products.

The restrictions on the sale or transfer of balata do not bar the sale of products made from balata which were in finished or marketable form on December 11, 1941, or which were finished after that date pursuant to processing not forbidden by government orders. All persons who own or have any balata in their possession must file a complete report with the Rubber Branch of WPB immediately.

Amendment No. 12, issued on August 5, tightens government control on transactions in all types of rubber by making the Rubber Reserve Co. the sole agency which may sell or purchase scrap or reclaimed rubber. Rubber Reserve is also the sole purchaser of crude rubber, latex and balata. At the same time, the order prohibits the regrooving of tires without prior written approval of the Director for General Operations. This action was recommended by OPA in order to prevent regrooving of tires on which treads are worn smooth. Several other changes were made by the amendment, as follows:

(1) Prohibition on the destruction of certain rubber articles is changed to a complete ban on destruction of all rubber articles with certain specific exceptions; (2) Definitions covering scrap rubber are made more detailed to clarify types which are covered by the order, and to emphasize that repairable tires and other products still usable for their original purposes are not considered scrap rubber; (3) The definition of "war

order" is changed to make it clear that purchase orders by post exchanges, ship's stores, and similar organizations are not classified as "war orders."

Amendment No. 13, issued on July 25, revises paragraph "h" of the original order, which relates to inventories, removing the limitation on accumulation of stocks of reclaimed rubber in the hands of reclaim consumers. Previously, reclaim consumers were limited to an inventory of 60 days' supply. The new amendment is expected to stimulate capacity operations. The full texts of Amendments Nos. 11, 12 and 13 to Order M-15-b will appear in our next issue.

Insulated Wire and Cable

Revised specifications governing the use of rubber in insulated wire and cable and making them applicable to all military uses in order to save an additional 150 to 200 tons of crude rubber per month were announced by WPB on July 10. Incorporated in Amendment No. 8 to Supplementary Order M-15-b-1, the new specifications are applicable to civilian orders, war orders, and all other orders placed by governmental agencies. An exception is made for certain types of wire and cable which require heavier than normal insulation, such as submarine cable. The full text of the amendment will be found on page 390.

At the same time, the Building Materials Branch of WPB warned that preference rating assistance cannot be granted for insulated wire to be used in any building not strictly essential to the war effort. This policy must be observed, it was added, because of the critical shortages which exist in copper and other materials entering into the manufacture of the wire. Ratings for wire will not be granted for buildings which can be used without electricity, or for repair and maintenance of circuits or services which are not absolutely essential. For instance, ratings will not be granted to repair a lighting circuit in a residence if another circuit within the residence is still usable.

Ratings for insulated wiring will be granted only for Army, Navy, Marine, and Maritime Commission purposes; for munitions plants; for war housing when certified by the WPB Housing Branch; for farm machinery in certain cases approved by WPB and the Department of Agriculture; and for essential maintenance and repair purposes.

Miscellaneous Products

Revised specifications were also set up in Amendment No. 9 to Order M-15-b-1, issued on July 21, for a long list of civilian products, including belting, hose, packing, dam and lock gate seals, hog scraper (beater) paddles, loom pickers, milk and milking machine equipment, pipe coupling rings, press die pads, printing rubber products, rubber-lined tanks, drums and rubber-protected industrial equipment, abrasive implements, and mine and industry safety parts. The changes in the amendment, reproduced in full on page 391, are expected to result in a saving of from 300 to 400 tons of crude rubber per month.

This big display erected beside the employee's entrance at the General Tire & Rubber plant in Akron has incited interest in increasing production. A quota is set for each of the four shifts, and the bomb positions are changed daily. The display has created unusual interest.

Rubber Footwear

Specifications for rubber footwear were revised in Amendment No. 10 to Order M-15-b-1, issued by WPB on July 21. An additional 100 tons a month are expected to be saved by the new specifications, with the same number of pairs manufactured per year as in the past. The full text of the amendment will be found on page 400.

Soles and Heels

In order to save the better grades of reclaimed rubber for more important uses, specifications governing the use of reclaim in the manufacture of soles and heels have been established in Amendment No. 11 to Order M-15-b-1, issued on August 5. The specifications prohibit the use of tire friction scrap, which makes a high grade of reclaim, in all heels and soles, whether made for civilian use or for the Army or Navy. A limited amount of this scrap, however, may be used in heels and soles for the Marine Corps until October 1 only. The specifications will be found on page 400.

Feeding Nipples

Specifications covering the manufacture of feeding nipples heretofore applied to infants' nipples only, the weight of rubber in each nipple of the molded type held to a maximum of .0105 pound and that for all other types to .007 pound. Amendment No. 12 to Order M-15-b-1, issued on August 3, provides specifications for lambs' nipples as well, the weight of rubber or latex in each finished nipple not to exceed .0105 pound. Specifications for infants' nipples remain the same. The amendment is reproduced on page 403.

Rubber in War Orders

Use of various types of rubber in the manufacture of products being delivered on war orders was curtailed by WPB on August 10 through the issuance of Amendment No. 13 to Order M-15-b-1. The amendment sets up two lists of products being made for war orders. Products on the first list may not be made with any crude rubber or latex while the other list bars the use of crude rubber, latex, reclaimed rubber or scrap rubber.

The two lists replace the previous single list which applied to Army orders only and which barred the use of crude rubber and latex only. Included on the first list (products for which crude rubber and latex may not be used, but for which scrap and reclaim are permitted) are such products as Pliofilm, sponge cushioning, gym and basketball shoes, friction tape, and water hose. The second list (products for which all types of rubber are prohibited) includes such products as ash trays, gun grips, pedal rubbers, serving trays, tractor and implement tires, typewriter keys, and wainscoting. The full text of the amendment, which becomes effective August 17, appears on page 403.

Rubber Cement

Strict prohibitions on the use of rubber cement were put into effect by WPB on July 31 after investigations by the Compliance Branch showed that large amounts of such cement were being consumed for luggage, handbags, novelties and other non-essential purposes. A new order—Supplementary Order M-15-f—forbids the use of rubber cement in a specific list of articles, whether or not the cement was manufactured before the effective date of existing rubber restrictions contained in Supplementary Order M-15-b. The latter order barred the use of crude rubber, latex, reclaimed or scrap rubber in the manufacture of rubber cement, except for certain permitted uses. No restrictions, however, were contained on the sale of cements which had already been manufactured.

The new order prohibits the sale, transfer or use of rubber cement in the manufacture, repair, combining, laminating, coating, impregnating, or treating of luggage, handbags, belts, pocketbooks, wallets, tobacco pouches, and similar items. Use of cement is permitted only for certain specific operations involved in the manufacture or repair of shoes and in products for which rubber may be consumed under provisions of Sup-

plementary Order M-15-b. The full text of the new order will be found on page 404.

Chlorinated Rubber

Three changes in the chlorinated rubber order—G.P.O. No. M-46—were made in Amendment No. 2 to the order, issued on August 1. The first removes permission to use chlorinated rubber in the manufacture of electrical insulation, substitutes being available; the second permits its use in the manufacture of core binder cement for use in casting equipment made for the armed services; while the third continues the order in effect until revoked. The order had been due to expire on July 31. Other permissible uses of chlorinated rubber, included in the original order, remain as heretofore.

Yarn and Thread

Two amendments to Conservation Order M-124, covering rubber yarn and elastic thread, have been issued. Under Amendment No. 4, issued on July 21, the Defense Supplies Corporation is made the sole purchasing agent for the rubber yarn, latex yarn and elastic thread frozen by the conservation order. On the same day, WPB amended schedule "A" of Priorities Regulation No. 13 to prohibit all other sales of these materials.

Under this amendment, bare and covered rubber thread purchased by the DSC will be held for allocation by WPB for use in military equipment and in specific health articles. Knitters and weavers having contracts for war materials or for essential items may purchase their supplies of rubber yarn or thread only from the DSC upon authorization by WPB.

The amendment also added industrial goggles and webbing for artificial limbs to the list of essential health items in which the use of previously fabricated rubber thread of size 61 or finer is permitted. The full list covered by this order now includes: webbing for respirators, hose masks, gas masks and inhalators; repair cords and webs; webbing for artificial limbs; surgical stockings; industrial goggles; edging for baby pants; trusses (including umbilical belts); supports for abdomen, back and breast, but only to the extent permitted under General Limitation order L-90; sanitary belts and men's athletic supporters, but only to the extent permitted under General Limitation Order L-137.

The second amendment, Amendment No. 5, issued on July 30, calls for the insertion of the word "surgical" before "supports for abdomen, back and breast."

FOUR ADDITIONAL CRUDE RUBBER AGREEMENTS CONCLUDED

Since our last issue, the United States has contracted for the purchase of exportable rubber of four more Latin American countries, *i.e.*, Bolivia, Mexico, Ecuador and Honduras. This now brings to nine the number of contracts signed between this country and the other American republics, previous arrangements having been concluded with Brazil, Peru, Colombia, Nicaragua, and Costa Rica.

Under the agreement with Bolivia, signed at La Paz on July 15, the United States will buy all rubber that country produces in excess of her own essential domestic needs and a maximum of 250 tons which will be available yearly for export to neighboring countries. The Rubber Reserve Co. will spend $2,125,000 in developing rubber resources in Bolivia. Output in 1942 is expected to reach 2,000 tons, while 1943 output, with the help of this country, may reach 2,500 or 3,000 tons. The price to be paid for Bolivian rubber ranges up to 45c a pound.

The agreement with Ecuador, announced on July 21 by the Department of State, Rubber Reserve Co., and the Board of Economic Warfare, follows the pattern of the other agreements. It provides for the purchase of all rubber produced in Ecuador for the next five years by the Rubber Reserve Co. which is not required for essential domestic needs. It also provides that Ecuador will receive an annual quota of at least 100 tons of manufactured rubber goods from the United States, chiefly tires, at prices to be set by this government. The rubber will be purchased at 33c a pound.

Although full details of the pact with Mexico have not been released at this writing (August 11), it is understood that under its terms Mexico's entire production of guayule, which approximates 9,000 tons a year, will be sold exclusively to the United States. In addition, Mexico has committed itself to measures to conserve its stocks of finished and raw rubber and it is probable that large surplus stocks accumulated before Pearl Harbor will be turned over to the United States. In addition to guayule, Mexico has been producing about 3,000 tons of crude rubber annually, and importing another 2,000 tons to meet its own domestic requirements.

The Department of State announced that it had signed an agreement with Honduras on August 3 providing for the purchase of all rubber produced in that country which is not required for essential domestic needs of that country. Like the other agreements, it provides for the purchase of the rubber by the Rubber Reserve Co.

Brazilian Picture Improves

The future of Brazilian rubber was further assured last month by the action of President Vargas in authorizing the Minister of Finance to organize the Banco de Credito da Borracha (Rubber Credit Bank) the purpose of which will be to extend financial help to all phases of the rubber industry. The capital of the new bank will be 50,000 contos (approximately $25,000,000), of which 55% will be held by the Brazilian Treasury, 40% by the Rubber Reserve Co., and the remaining 5% to be available to Brazilians only. The bank will be empowered to give aid by means of loans to producers, merchants and all others connected with the industry.

Governmental agencies concerned with crude rubber supplies still feel that the Amazon Valley may eventually prove to be the main supply source of rubber. According to the Office of Inter-American Affairs, the estimated 300,000,000 wild trees in Brazil, Venezuela, Peru, Bolivia, Ecuador and Colombia are expected to produce 50,000 tons of rubber in 1942.

J. W. Bicknell, vice-president of the Rubber Reserve Co., recently told a Senate committee that Rubber Reserve's share of increased rubber production in Latin America will be 10,000 to 13,000 tons this year, 30,000 to 40,000 in 1943, and perhaps 60,000 to 80,000 annually after 1943. Rubber production in Latin America in 1941 totalled about 25,500 tons, of which Brazil produced 17,500 tons. Peak production in the Western Hemisphere approximated 64,000 tons, of which Brazil produced nearly 36,000 tons and Mexico 17,500 tons.

Dr. Earl N. Bressman, director of the agricultural division of the Office of Inter-American Affairs, estimates that large-scale organization of rubber production in the Latin American countries may bring out 90,000 tons of rubber annually. He estimates that probably 50,000 tons may be obtained from the Hevea trees in the Amazon basin, 30,000 tons from the Castilla trees in the northern section of South America and in Central America, and nearly 10,000 tons of guayule from Mexico.

The rapidly expanding synthetic rubber program of the United States will not halt imports of natural rubber from American rubber-producing countries when the war is over, according to a recent statement by Secretary of Agriculture Claude R. Wickard. The Cabinet officer said that the United States government had retained control of the synthetic rubber plants "with the feeling that they should not be operated behind a tariff wall that would mean high-priced rubber for United States consumers and at the same time could interfere with trade with our Good Neighbors to the south of us." The statement was made during the Second Inter-American Conference on Agriculture, held in Mexico City last month.

Rubber from Belgian Congo

An agreement has been reached between the British and Belgian Colonial governments under which Britain will purchase rubber produced in the Belgian Congo. Although no price was an-

nounced, it was said that the price was sufficient "to bring forward the maximum quantities available." The Belgian Colonial government has established a commission to administer and stimulate production of both plantation and wild rubber and steps have been taken to reopen abandoned plantations.

The Belgian Congo has not heretofore played a very important part in the world's production of rubber. A total of 7,200 tons was shipped from Africa in 1940, apart from 2,900 tons produced in Nigeria and the British Cameroons. It is believed, however, that with proper stimulation production in the Congo will reach respectable proportions.

Firestone Resumes Experiments

Development of rubber-bearing plants investigated by the late Thomas A. Edison, principally goldenrod, is to be carried forward by the Firestone Tire & Rubber Co., according to an announcement from Akron on July 14. Mr. Edison's original interest in the possibilities of rubber from goldenrod was shared by the late Harvey Firestone, Sr., and Henry Ford. This triumvirate formed the Edison Botanic Research Corp., which, after the death of Mr. Edison, turned over its findings and reports to the Department of Agriculture.

It was also learned that the Department of Agriculture is beginning additional work on goldenrod in New Orleans. An experimental plantation near Savannah, Georgia, has been in operation for several years. At the latter plantation, almost 150 acres are under cultivation and yields as high as 100 pounds an acre from five-foot goldenrod plants have been reported. Although Firestone will engage in all phases of increasing the rubber yield from goldenrod, special emphasis will be placed on the development of adequate extraction systems.

FINAL REPORT MADE ON NATION-WIDE SCRAP RUBBER DRIVE

President Roosevelt, on July 21, made public a report from William R. Boyd, chairman of the Petroleum Industry War Council, which disclosed that 454,155 tons of scrap rubber were added to the nation's stockpile as a result of the country-wide collection between June 15 and July 10. This represented a collection of 6.87 pounds per capita. The report covered only the amount of rubber actually moved to petroleum bulk stations and weighed. It did not cover rubber collected but yet remaining in filling stations or rubber taken in by junk dealers and salvage committees. The final report has yet to be made.

California, with 40,247 tons, led all other states with respect to quantity, but Nevada had the highest per capita contribution, 30.13 pounds. New York, with a per capita collection of only 2.88 pounds, was fiftieth among the states and territories, but was sixth in the amount collected, 19,385 tons. New Jersey was only a few points ahead of New York with a per capita percentage of 3.07. Ohio collected 22,165 tons for a per capita percentage of 6.42.

A new intensified nation-wide salvage program, which includes the continual collection of scrap rubber, has been launched by the Conservation Division of WPB. Formation of the American Industries Salvage Committee, with headquarters in the Empire State Building in New York, representing groups of leading industrial concerns who are working with the Division on the program, was announced on July 20. This committee has launched a $2,000,000 advertising campaign designed to bring in the scrap. R. S. Wilson, vice-president of Goodyear, is a member of the administrative committee directing the campaign, representing the Rubber Manufacturers Association.

Organized volunteer efforts of two of the country's leading industries have also been added to the Conservation Division's drive. The Automotive Safety Foundation, with its membership of rubber, automotive and oil companies, and the Farm Equipment Institute and National Retail Farm Equipment Association, representing the manufacturers and dealers of farm equipment, are the two groups. These groups, through their dealer organizations, have volunteered to provide official receiving depots to accept donations of scrap metal and rubber, or to help local salvage committees locate such depots on vacant lots or in empty buildings.

Position of Scrap Agents

As reported last month, the firms of Muehlstein, Schulman, Lowenthal and Berzen are acting as agents for the Rubber Reserve Co. for the purchase of scrap rubber. All four of these companies were charged with making large profits out of the nation-wide scrap rubber salvage campaign. The charges were brought by Elliot Simpson.

The charges were answered on July 13 by Jesse Jones in his capacity as head of the Reconstruction Finance Corp., of which Rubber Reserve is a subsidiary. According to Mr. Jones, as a result of their contracts with the government the four companies are no longer in the scrap rubber business on their own account and can not buy, sell or deal in scrap rubber except for the account of Rubber Reserve. All four companies, he added, had agreed to render this service to Rubber Reserve without profit, but will be reimbursed for their actual costs and expenses.

Making no reference to the Simpson charges, Mr. Jones said that Messrs. Muehlstein, Schulman, Lowenthal and Berzen have nation-wide facilities and in the course of ordinary business bought and sold about 80% of all scrap rubber collected. Under the present arrangement, other dealers may sell scrap to Rubber Reserve through one of these agents at $25.00 a ton, carload lots, f.o.b. point of shipment, and 6c a pound for tube scrap.

The four agents, Mr. Jones stated, have purchased 103,400 tons of scrap rubber for Rubber Reserve (as of July 13). They began buying from other dealers for the government agency's account immediately after announcement of the $25-a-ton price. These purchases were entirely independent of, and in addition to, the scrap gathered by the oil companies in the nation-wide drive authorized by President Roosevelt.

Premium Prices Restored

Limited conditions under which premium prices above ceiling levels still may be paid for large quantity deliveries of scrap rubber to consumers are outlined in Amendment No. 2 to Revised Price schedule No. 87, issued by OPA on August 1.

In the scrap rubber price schedule, as it existed before June 26, when broad revisions were made, there was a provision for payment of specified premiums above the maximum prices for large deliveries completed within a 60-day period. The premium quantities were 150 tons for scrap tubes, 400 tons for peelings, and 750 tons for scrap tires.

Although the premium provision was withdrawn on June 26, under the terms of the new amendment OPA will permit payments of the premiums formerly allowable in cases where the contract for sale was made before that date and the former premium requirements are fulfilled.

Urge Sale of Buffings

The Conservation Division of WPB issued a plea on July 28 urging all tire retreading shops throughout the country to accumulate their production of rubber buffings and sell them to scrap rubber dealers. Relaxation of shipping restrictions by the Interstate Commerce Commission, the division pointed out, now makes possible the reclamation of this important and desirable form of scrap rubber.

In the past, ICC regulations permitted shipment of rubber buffings only in steel drums or metal-lined wooden cases. This was due to a tendency of the buffings to ignite as a result of spontaneous combustion. Now, in response to efforts of the Conservation Division the regulations have been somewhat relaxed.

The ICC has ruled that rubber buffings can now be packed for shipment in Spec. 10A wooden barrels or kegs, Spec. 12B fiber boxes, Spec. 21A fiber drums, Spec. 22A wooden drums, or in tank cars tightly and securely closed. Fiber boxes are recommended as the cheapest and most available type of container.

TIRE DEALERS AND WHOLESALERS UNDER LICENSING REGULATIONS

According to an announcement by OPA on July 23, retailers and wholesalers of new tires and tubes are licensed under the General Maximum Price Regulation and may have their licenses revoked for violation of the price schedules under which they operate. Amendment No. 3 to Revised Price Schedule 63 and Amendment No. 1 to Maximum Price Regulation 143, both of which became effective on July 24, make plain that the registration and licensing provisions of the general order apply to sellers governed by either or both of these orders.

A list containing the names and business addresses of field representatives who may be called upon by tire dealers, recappers and truck operators and other users of tires for advice and help in handling problems arising under the tire rationing regulations was made public by OPA on July 24. The list showed the location of regional offices, in which are usually placed regional tire rationing representatives, tire quota specialists, and tire eligibility specialists, and also gave the name and address of state tire rationing representatives.

Larger Quota in August

Tire and tube quotas for August, both larger than July, were announced by OPA on July 24. Passenger car tire quotas for the states and territories total 58,308 new tires for applicants on List A, which includes the most essential services, 87,860 Grade II new tires for a special war worker classification, 637,959 recapped tires or recapping services, and 418,910 inner tubes. July quotas were 57,097 new for List A, 23,402 Grade II, 555,077 recaps and 323,087 tubes.

The reason for the sharp increase in the Grade II quota is that the July allotment of tires of this kind was for only the last half of the month. The amendment to the rationing regulations which makes Grade II casings available to a restricted classification of war workers did not become effective until July 15. The expanded recap quota also reflects, in large part, increasing employment in war occupations which make workers eligible for tires.

The quotas for trucks, busses, farm tractors and other heavy vehicles have been increased partly in accord with seasonal pattern, partly in response to evidence of increasing need on the part of eligibles. New tire quota for August is 316,695 against 268,925 for July, while the allotment of recapped tires or recapping services is 355,883 against 314,896 and the tube quota is 347,696 compared with 299,265.

Three New Amendments

Three new amendments to the Revised Tire Rationing Regulations have been announced by OPA since our last issue, as follows:

Amendment No. 21, issued on July 18, makes Army and Navy personnel eligible for recapped tires for passenger cars used principally in necessary transportation between residence and post of duty, or on official military business where no military vehicle is available. Heretofore such personnel could get recaps or inner tubes only under the "war worker" classification when they were acting as technical men on construction jobs or in defense plants.

Amendment No. 22, issued on July 20, reduces the truck eligibility list. Only trucks engaged in services essential to the war effort or public health and safety are now entitled to recapped or new tires. The revision, necessitated by increasing evidence that quotas will not provide for the needs of all those on the recent eligibility lists, cuts off from tires all privately operated trucks carrying alcoholic beverages, soft drinks, tobacco products, flowers, furs, radios or other luxury goods unless the transportation of such things is only incidental to the main service performed by the vehicle.

Amendment No. 23, issued on July 29, provides means by which those who get rationing certificates can be supplied quickly with tires of any size. Manufacturers will be permitted, subject to certain restrictions, to store tires and tubes regionally in private warehouses and other premises where they will be convenient to meet demand. Even retail establishments may be used for storage, provided the manufacturers' stocks are segregated from the dealers' and are not subject to his control.

MISCELLANEOUS RULES AND REGULATIONS OF INTEREST

Manufacturers whose normal business consists only of packing those products for which rubber-sealed closures were barred by Order M-119 have been given permission to use inventories of such closures which were manufactured by April 19. Permission is contained in Amendment No. 1 to the order, issued by WPB on August 5.

Ethyl alcohol used in the manufacture of synthetic rubber has been exempted from the provisions of the General Maximum Price Regulation under the terms of Amendment No. 18 to Supplementary Regulation No. 1 of the general regulation, effective August 4. The exemption applies only to ethyl alcohol sold for the use specified.

Phthalate plasticizers, used in the manufacture of plastics, synthetic rubber, lacquers and smokeless powder, have been placed under complete allocation control by WPB. Form PD-606 has been provided for persons seeking delivery of the plasticizers. The allocation system becomes effective September 1.

Control of the distribution of aniline, used in the manufacture of synthetic rubber, explosives, dyes, drugs and other chemical products, is now in the hands of WPB. Conservation Order M-184, covering control of this vital material, was issued on July 13. The action was taken to conserve supplies rather than because of existing shortage.

Limitation Order L-163, placing strict control over the distribution of turbo-blowers, vitally necessary to the synthetic rubber and other war programs, was issued by WPB on August 7. Application for authorization to place orders for turbo-blowers must be made on Form PD-616.

Amendment No. 1 to G.P.O. M-41, issued by WPB on August 2, eases the restrictions on the use of carbon tetrachloride. The amendment, issued as a result of a temporary surplus of the material, doubles the quantity certain users may consume between the date of its issuance and September 30.

Thacher with Munitions Board

Following his recent appointment as director of rubber conservation of the Motor Transport Service of the Office of the Quartermaster General, Sheldon P. Thacher, formerly manager of the field engineering and service departments of the U.S. Rubber Co., has recently been designated as Chief of the Rubber Conservation Section of the Army and Navy Munitions Board. His duties will be to organize, coordinate and direct all rubber and rubber products conservation activities with respect to natural, synthetic and reclaimed rubber throughout the armed services—land, sea and air. He will also maintain contact with WPB, Rubber Reserve, ODT, and other government agencies concerned with the rubber problem.

Change Safety Convention Dates

The Thirty-first National Safety Congress and Exposition, originally scheduled to be held at the Stevens Hotel in Chicago from October 5 to 9, will be held at the Sherman, La Salle and Morrison hotels instead on October 27-28-29. These changes of date and location are due to the fact that the Army Air Force has taken over the Stevens Hotel, the largest hotel in the world, for its technical training school. The Sherman will serve as headquarters for the convention, but sessions and committee meetings will be held at all three of the new hotels selected.

UNITED CARBON COMPANY SPONSORS TWO CONFERENCES ON THE USE OF CARBON BLACKS IN THE COMPOUNDING OF SYNTHETIC RUBBERS

Two conferences on the use of carbon blacks in the compounding and processing of various types of synthetic rubber were sponsored by the United Carbon Company at Charleston, West Virginia, last month. The first was held on July 17 and 18 and was attended by several members of the War Production Board and technical representatives of the major rubber companies. The second was held on July 31 and August 1 for the benefit of those rubber companies which did not have an opportunity to attend the first conference.

The War Production Board was represented at the first conference by Frank H. Carman, chief of the Synthetic Rubber Section, and G. L. Roberts, one of his assistants. Rubber companies represented included Firestone, Goodrich, Goodyear and U. S. Rubber. Dr. I. Drogin, director of research for United Carbon, presented the results of studies conducted by the company for the past several months on the application of carbon black in synthetic rubbers, supporting his discussion with numerous slides.

Dr. Drogin showed how the different synthetics compare with each other and with natural rubber, the effect of different types of blacks, and the effect of blending the synthetics with smoked sheet or reclaim. H. Walter Grote and R. Lorentz of the company's research laboratory participated in the presentation.

Mr. Carman also attended the second conference, as did Mr. Roberts. Andrew Tomlin, another of Mr. Carman's assistants, was present at the second conference, as was A. L. Freedlander of the Rubber Branch of WPB. G. A. Lee, special advisor to H. M. Williamson, controller of supplies in connection with synthetic rubber problems of the Canadian Government, and L. E. Masheter, technical liaison officer of the Dunlop Rubber Co. of England and connected with the British Purchasing Commission in this country, were also present. The rubber industry, at this second conference, was represented by technicians from thirty-six rubber companies located in the United States and Canada.

At this second conference Dr. Drogin again presented the results of the company's extensive study and research work on the effect of carbon blacks in the reinforcement of various synthetics. Details of this study have been assembled in book form and a copy of the book presented to those attending the conferences.

A general discussion followed Dr. Drogin's address. Mr. Carman related the progress being made in the manufacture of synthetics and the developments in the adaptation of the synthetics to the war effort. He said that all the rubber reserve is now owned by the Government. He told of the efforts to standardize the information on synthetics and asked the representatives of all the rubber companies to request samples.

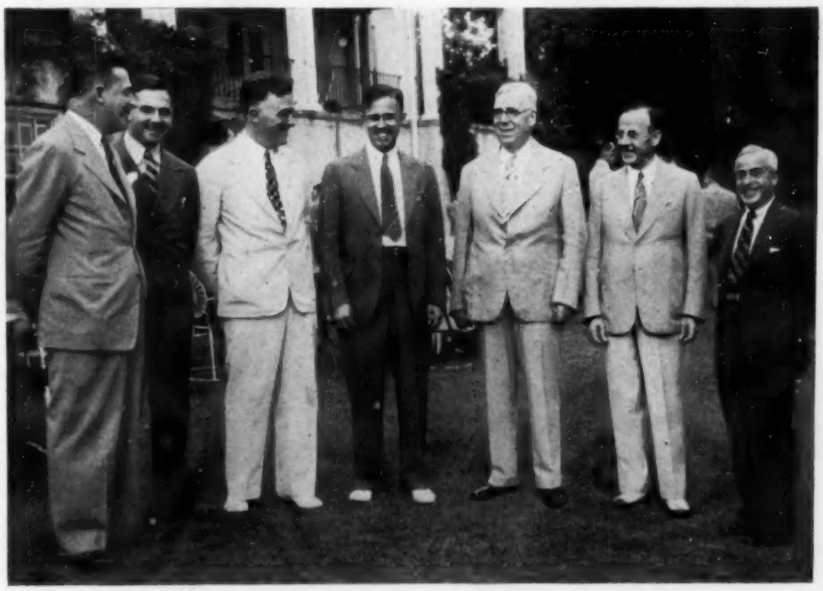
Mr. Carman emphasized that it was up to the rubber companies to work out their problems in synthetics as quickly as possible; that if they did not have samples, to be sure to get these at once. He urged the group to show greater interest in Buna S. He mentioned that the carbon black situation may be affected by the adaptation of channel process carbon black to carcass stocks.

Mr. Freedlander conveyed a message from Dr. H. E. Simmons regarding the progress of Dr. Simmons' new committee in its efforts to standardize information on synthetics and the committee's plans to disseminate such information to the rubber industry. Mr. Freedlander said that one cannot think of synthetic rubber without thinking at the same time of carbon black to reinforce it and therefore the basic research conducted by the United Carbon Company in connection with reinforcing synthetics will be of immense help to the rubber industry when synthetics become available in quantities. It will save the rubber industry a great amount of research work and make possible speedier adaptation in the manufacture of synthetic rubber articles.

Oscar Nelson, president of United Carbon, stressed the position of the carbon black industry in relation to the requirements of synthetic rubbers for certain types of black. He said that many months ago when synthetic rubber first received serious consideration he had the impression that the soft blacks produced by thermal decomposition would be required for the rubber substitutes. However, the research work done by his company has now convinced him that these blacks are not competent to perform the task of fully reinforcing synthetics. He is certain that it will take a channel process black or a type with characteristics similar to those of channel process blacks to strengthen synthetic rubber.

Mr. Nelson stated that the rubber industry is now leaning towards a "softer" channel process black for the reinforcement of synthetics. The large quantities of natural gas now generally available for the manufacture of carbon black are being so thoroughly stripped of certain components urgently needed in the war effort that the residual gas presents greater difficulties in the manufacture of the so-called "soft" channel process black. He said that those carbon black manufacturers who depend upon this highly stripped gas for the manufacture of carbon black are faced with the fact that in the production of the "soft" type of channel process black, under existing plant facilities, the recovery will be lower than is possible when such quality gas is used in the production of the harsh or hard type channel process black. The lower recovery signifies lower output.

This, Mr. Nelson reminded the group, may be viewed with concern for if such production conditions should continue it may well result in a shortage of black at a time when the government's synthetic rubber program is in full swing. He mentioned that when the rubber industry was at its peak, the demand for carbon black exceeded the production.



Part of the group attending the second carbon black conference at Charleston, W. Va., sponsored by the United Carbon Co. From left to right: G. L. Roberts, George A. Lee, Guy Stone, Frank C. Carman, Oscar Nelson, A. L. Freedlander and Dr. I. Drogin. The photograph was taken on the lawn of the Edgewood Country Club where those attending the conference were tendered a dinner by the company. Mr. Stone, president of the Charleston Bar Association, acted as toastmaster.

TIRE MANUFACTURING INDUSTRY PRESENTS PLAN ON CIVILIAN TIRES WITH VISUAL DISPLAY OF FACTS AT HOTEL WILLARD IN WASHINGTON

A comprehensive plan to cope with the civilian tire problem, which if feasible would keep all essential motor transportation on the roads for the next two years or until the synthetic rubber program hits its full stride, was presented visually in a display at the Hotel Willard in Washington the week of July 21. The display, or blueprint as it has been called, was prepared by a committee of the directors of the Rubber Manufacturers Association for passenger car transportation.

The display was presented in the form of panels devoted to such materials as crude rubber, reclaimed rubber, Buna S, Butyl and Thiokol. Actual samples of all materials were exhibited, as well as tires made entirely from or recapped with the various rubbers. Mileage data was given in all cases. The crude rubber panel showed a table indicating that 89% of crude rubber centers are now in the hands of the Japs, 7% was threatened, and only 4% was still available. Samples of plantation and wild rubber from all parts of the world were displayed.

Full Cooperation Required

In presenting the plan, the point was emphasized that it could succeed only if (1) Maximum speeds do not exceed 40 miles per hour; (2) Average passenger car mileage is reduced by 40% under 1941; and (3) Tires are given proper care by car owners. The plan is not a cure-all for all driving, but is designed to keep all mechanically usable passenger cars operating for the next two years.

The plan, summed up in the accompanying tables, would leave for military and non-tire civilian requirements nearly all of the nation's crude rubber supplies, over 85% of all reclaim producing capacity, all the Buna S and neoprene capacity now scheduled, as well as a portion of the expected Thiokol and Butyl production.

The present tire rationing procedure would be continued, spokesmen for the industry emphasized. The plan would involve moderate changes, however, in the present Class A and Class B groups, and all other car-owners would be included in a new Class C. This new class, representing almost 23,000,000 cars, would be able to get new or recapped tires made of reclaimed rubber or of such materials as Thiokol or Butyl, production of which is being increased.

As at present, recapping would be compulsory for all applicants regardless of which group they fall in, except where old tires cannot be recapped and where no recapped tires or recappable carcasses are available for purchase. Separate ration quotas should be established monthly for classes A, B and C and certificates issued by the ration boards, the plan recommends.

This plan would require for the two-year period:

(a) 30,291,000 recaps (reclaim, Thiokol, or Butyl).

(b) 13,223,000 new tires (reclaim, Thiokol, or Butyl).

(c) 4,660,000 of frozen tires.

These replacements would take care of the tire needs of the passenger cars that will be in good mechanical condition during the next twenty-four months, it was explained. The industry committee said it would continue to meet frequently. It will formulate specific recommendations regarding the passenger car transportation problem during and after the period covered by the present plan.

Raw Materials Needed

Raw materials needed to carry out the plan for the two-year period would be:

(a) 97,420 long tons of reclaimed rubber.

(b) 3,332 long tons of crude rubber.

(c) 33,188 tons of Thiokol.

(d) 32,475 tons of Butyl.

Since each recipient of a new tire under the program would be required to turn in a used tire for scrap, a substantial amount of additional scrap would be collected for reclaiming.

The tonnage requirements for the plan, spokesmen said, were developed on the assumption that 75% of anticipated Thiokol and Butyl production will be made available for passenger tire use. If more than 75% is released, or if expansion of projected capacities occurs, Thiokol can be substituted for the stated requirements of reclaimed rubber, on the basis of 100 tons of Thiokol for each 80 tons of reclaim. Likewise Butyl can be substituted in the ratio of 100 tons of Butyl for each 140 tons of reclaim.

Plan is Under Consideration

Shortly after the presentation of the visual display, Rubber Coordinator Arthur B. Newhall stated that a thorough study of the plan was being made. He said that the rubber industry has done an immensely interesting job, but there are a great many "ifs" in the program it has presented. His statements on some of these "ifs" follows:

One of the problems involved is whether the Government can make available 97,420 long tons of reclaimed rubber. Since military demands are very large, a policy decision must be made as to whether this amount could be spared.

Another point is whether we can spare 3,332 long tons of crude rubber. Our stock pile is diminishing in size, and if we take any crude rubber at all from the stock pile, we will be taking it away from the only guaranteed source of crude rubber that we can see.

The new plan also calls for 33,188 tons of Thiokol and 32,475 tons of Butyl. While the production of these materials is being expanded as rapidly as possible, I should like to point out that in 1942 we do not expect to have more than 300 long tons of Butyl rubber, and do not expect to have more than 12,000 long tons of Buna N and Thiokol together. This raises the serious question as to how much of these types of rubber could be made available promptly for the program outlined.

The nub of the situation, as I see it, is this—If we can spare the reclaimed rubber, the crude rubber, the Thiokol, and the Butyl, and if all motorists would engage only in essential driving, and if motorists will cut speeds to 40 miles an hour, and if they take the best care of their tires—then, and only then, could this or any other such plan be adopted.

TIRES AND RECAPS REQUIRED TO KEEP ALL CARS RUNNING

	July, 1942-July, 1943	July, 1943-July, 1944	Two Years Ending July, 1944
New Tires	4,796,000	8,427,000	13,223,000
Recaps	10,688,000	19,603,000	30,291,000
From Inventory	2,330,000	2,330,000	4,660,000
Total Units	17,814,000	30,360,000	48,174,000

Notes: (1) Present frozen inventory amounts to 8,500,000 tires. (2) There are 10,000,000 new tubes now in inventory, therefore no tube production is required unless an unbalanced size condition occurs. (3) Field recapping capacity is sufficient to handle first year requirements. Any excess in the second year will be recapped in original molds at tire factories.

REQUIREMENTS FOR NEW TIRES AND RECAPS
(In Long Tons)

	July, 1942-July, 1943	July, 1943-July, 1944	Two Years Ending July, 1944
Reclaimed Rubber*	48,769	48,651	97,420
Thiokol	10,688	22,500	33,188
Butyl (Flexon)**	2,475	30,000	32,475
Natural Rubber	1,189	2,143	3,332

*1942-43 surplus capacity 68,000 tons. **Using 75% projected production (of Butyl). Note: If additional Thiokol and Butyl became available less reclaim would be needed.

PLASTIC SUBSTITUTE MATERIAL MEETS RUBBER SPECIFICATIONS

A new substitute for rubber in waterproof fabrics which meets specifications for natural rubber and can be handled with the same machinery and processes as rubber has been announced by Joseph L. Haas, technical director and fabric superintendent of the Hodgman Rubber Co., Framingham, Mass. The new substitute is Saflex, a plastic of the vinyl acetal type, developed by the Monsanto Chemical Co., already familiar to the automotive and glass industries as the tough, resilient interlayer in safety glass.

The process for plasticizing and compounding Saflex so that it can equal and even surpass the performance of natural rubber when applied to fabric by conventional rubberizing methods was developed by Mr. Haas in conjunction with research chemists of Monsanto's Plastics Division at Springfield, Massachusetts. Both process and materials are available to other manufacturers, thus enabling the development to serve the war effort as widely as possible.

Saflex-coated fabric, which the Hodgman company has christened Horco-X, has already been made into Army raincoats, hospital sheeting, gas protective fabric, life-preserver jackets and water bags, while many other military items are awaiting final action or are still in the experimental manufacturing stage.

The Hodgman company has been engaged for many years in the coating of fabrics, primarily with rubber, for the rainwear, sportswear, footwear, industrial and hospital fields. Their first work with the vinyl acetal plastics dates back before the war, but at that time the heavy demands of the safety glass industry made these materials relatively scarce. When the war cut off natural rubber supplies and made the usual substitutes almost equally hard to get, the process Mr. Haas had developed was perfected.

By this process, Saflex is transformed from a thermoplastic to a thermosetting material with markedly increased resistance to solvents and greatly decreased water absorption. As a result, the Saflex-coated fabrics produced by the Hodgman company readily meet most of the tests applied to rubber, oil and pyroxylin coatings and in many cases outstrip the materials around which the tests were written. In government tests of the raincoat material, it did not crack at —60° C. nor adhere to itself at 120° C., and many other advantages over other synthetics were revealed, particularly in coats with full cemented and cured seams.

In the Army raincoats, the Hodgman process for using Saflex will save more than 1¾ pounds of rubber per coat while proportionately greater savings will result from its use in heavier fabrics such as the hospital sheeting and gas protective cloth. With a 10,000,000 man Army, the saving in raincoats alone would amount to as much as 17,500,000 pounds of rubber. At the same time, since it is possible to use a lighter base fabric with Saflex, the new Army raincoats will weigh two pounds less than the present rubberized coats.

Equally important, the modified plastic lends itself to the coating of fabric by either of the two conventional rubberizing methods—spreading or calendering —more readily than any synthetic rubber or resin.

The entire processing and curing of Saflex is so analogous to that of rubber that no changes from the usual procedure are necessary, no new equipment or mechanical adjustments are needed and no additional training is required for labor. The properly plasticized Saflex is received in cakes which can be cut into convenient slabs for milling and compounding quickly and easily since the material does not have to be broken down like rubber. If the plastic is to be made into cement for spreading, it is then taken from the mill and placed into churns with a solvent. If it is to be calendered, it is taken off in convenient sheets and stacked until used.

Before calendering these sheets are warmed-up in the usual manner on a mill and fed into the calender where they are joined to cloth in the same manner as rubber. The coated fabric is then either draped in a heater to be cured or sent to the cutting room where it is fabricated into finished articles which are cured after fabrication. Curing is accomplished at the same temperatures at which rubberized articles are vulcanized, and the change during curing from a thermoplastic to a thermosetting material is remarkably similar to the change which takes place in natural rubber during vulcanization.

In fact, Mr. Haas points out, Saflex is so much like rubber in its reaction to plasticizing, compounding and cure that it may have far-reaching possibilities as a rubber replacement beyond the coating field.

Coming Events

Sept. 10-11. Rubber Division, A.C.S., Fall Meeting, Hotel Lafayette, Buffalo, N. Y. (General Meeting of the A.C.S. on September 9 features a Symposium devoted to a discussion of synthetic rubber).

Oct. 12-14. American Society of Mechanical Engineers, Fall Meeting, Rochester, N. Y.

Oct. 27-29. National Safety Congress, Sherman Hotel, Chicago, Ill.

Nov. 16-18. American Institute of Chemical Engineers, Annual Meeting, Hotel Netherlands Plaza, Cincinnati, Ohio.

Nov. 24-29. Second National Chemical Exposition, Sherman Hotel, Chicago, Ill.

Nov. 30-Dec. 4. American Society of Mechanical Engineers, Annual Meeting, New York City.

A. S. A. APPROVES FIVE NEW RUBBER TESTING STANDARDS

Five standards of the American Society for Testing Materials for testing rubber products and one A.S.T.M. specification for a rubber product have been approved by the American Standards Association as American Standards.

The specification (C59.12-1942) is for electrical workers' rubber gloves of two classes: gloves intended for use without external protection; and gloves intended for use with external protection of leather or other material. The specification covers electrical properties, physical properties, thickness, marking of size, and even method of inspecting and packing the gloves. A separate section of the standard outlines tests for strength and for resistance to electric current.

The other five standards cover: 1—Method of Test for Accelerated Aging of Vulcanized Rubber by the Oven Method (J5.1-1942); 2—Method of Test for Accelerated Aging of Vulcanized Rubber by the Oxygen-Pressure Method (J4.1-1942); 3—Method of Test for Adhesion of Vulcanized Rubber (Friction Test) (J3.1-1942); 4—Methods of Sample Preparation for Physical Testing of Rubber Products (J1.1-1942); 5—Methods of Tension Testing of Vulcanized Rubber (J2.1-1942).

These test methods apply to soft vulcanized rubber compounds such as are used for the lining and cover of hose and belting, for carcass and tread of tires, and for a wide variety of molded or extruded rubber products. They describe procedures for determining stress-strain properties, tensile strength, etc., of the usual grades of soft vulcanized rubber.

They cover the procedures for testing the strength of adhesion between plies of fabric bonded with rubber or the adhesion of the rubber layer in articles made from rubber attached to another material. Two of the standards give alternate methods of estimating the relative resistance of vulcanized rubber to age deterioration.

In the face of the present rubber shortage standards such as these should prove helpful in preventing deterioration of quality and a lowering of workmanship standards in the manufacture of articles like tires and electrical gloves, and fire hose. All six of these standards may be obtained from the American Standards Association, 29 West 39th St., New York, at 25c per copy.

Myristilene—New Fatty Acid

Myristilene, a new synthetic fatty acid with a wide variety of suggested uses, including that of a rubber softener and wetting agent, has been announced by the Beacon Co., 89 Bickford St., Boston, Mass. The iodine number of the new material is 40.3; the saponification number, 204; and the titre, 40° C.

LOS ANGELES GROUP ENJOYS TWO-DAY SPECIAL "OUTING"

That the seventy-one members of the Los Angeles Group, Rubber Division, A.C.S., who attended the two-day "outing" held by the group at the Uplifters' Club in Los Angeles on July 24 and 25 thoroughly enjoyed themselves is best indicated in the photographs reproduced in the adjoining two columns. This is the first "outing" of its kind the group has held and took the place of the usual summer fishing trip.

The members met for an evening supper, played games of all kinds (as the photographs depict) later in the evening, enjoyed a midnight barbecue, had breakfast the following morning, participated in a full day of sports activities, and topped it off with a late buffet lunch. Special prizes were distributed at the conclusion of the event.

Numerous contests were held for the prizes. A special prize of a $50.00 war bond, presented by the group itself, went to E. W. Peterson (Goodrich). Door prizes were won by Andrew Andrews (Commercial Rubber Co.), Frank Shew (Grizzly), and Charles Lamb, Sr. (West American Rubber). In the Intelligence Test, Bill Haney (Kirkhill Rubber) won a card table and chairs while other prizes went to Frank Shew and Tom Wigglesworth (B and B Chemical). This contest consisted in naming at sight the chemical contents of bottles, a line of 30 bottles being placed on a table and the contestants being required to identify them without lifting, testing or smelling the bottles.

A Pajama Contest was one of the highlites of the outing. Vic Vodra (Vanderbilt) won the prize for the most antique pajamas, L. F. MacDonald (Los Angeles Shipyards) that for the most de luxe pajamas, and C. H. Kelly (Goodyear) for the most comical. Pajamas in quality and fashion ranged from the sublime to the ridiculous, but the contest was judged one of the best held during the two-day event. Another mirth-provoking "act" was a mock trial conducted by Judge LeRoy Dawson, of Los Angeles, noted humorist and radio entertainer.

George Steinbach, Gaelen Norton, Laurence MacDonald and Charles Reinke were on the Reception Committee. C. H. Kelly, Edward L. Royal, and Bert Dougherty were particularly active in the solicitation of prizes, donated by the following companies, largely through their local representatives:

Acme White Lead & Color Co., American Cyanamid & Chemical Corp., American Turpentine & Tar Co., Arrowhead Lime & Chemical Co., L. H. Butcher Co., Godfrey L. Cabot, Inc., Crane Co., T. A. Desmond Co., Dill Mfg. Co., C. V. Fetty Co., General Atlas Carbon, General Magnesite & Magnesia Co., C. P. Hall Co., W. C. Hardesty Co., J. M. Huber, Inc., E. M. Jorgensen Co., Kinney Iron Works, Los Angeles Soap Co., H. Muehlstein & Co., N. J. Zinc Co., H. M. Royal, Inc., San Francisco Sulphur Co., A. Schrader's Son, Southeastern Clay Co., Stamford Rubber Supply Co., Stanco Distributors, Inc., Thompson, Weinman & Co., Thiokol Corp., R. T. Vanderbilt Co., Western Insulated Wire, Inc., and Western Shade Cloth Co.

L. F. MacDONALD, Treasurer, pajama-clad, rakes in the money.

The Gang at Breakfast - Ed Royal (with hat) and President Norton (who should have hat) in lower left foreground.

Ye Olde Barber Shop Quartet had nothing on this group of enthusiastic songbirds. The hairless tenor in front is G. K. Norton, Prexy of the Group.

The Cubists - (Left to right) Frank Keefe, Ernie See, V. S. Anderson, Harry Franklin and Ray Cowles.

Frank Keefe and George Steinbach in a little fun.

Hats Off - Howard Keefer and Harry Prouse are good-looking when they are dressed like this!

(Below) Harry Franklin and Bill Haney after a hard day afield. Ask Bill for his coat and you get his shirt too.

The Champ! - R. L. Bonham (left) and A. Angell after the set. To the victor went the prize but not the shirt.

(Below) - The Gentler Boys in a game of ping-pong while a recognized expert keeps score.

Auditing the Accounts - Ed Royal (center) with Treasurer MacDonald and witness Claude Kelly.

(Right) Ed Royal with the long reach and Kirk Hill with the benign look enjoy dominoes and a bottle.

(Below) - Harry Prouse and Frank Keefe in a sprightly mood.

Photos by Jordan—Captions by Tufft

New Rubber Dressing Materials

Several new preparations, intended to prolong the life of tires and other rubber products, have recently made their appearance. These include the following:

Extra Mileage Tire Preservative: Introduced by the Firestone Tire & Rubber Co., Akron, this is a liquid tire-coating material which when applied to tires counteracts the effects of aging and other results of climatic conditions that hasten rubber deterioration. It is also said to restore, to a marked extent, the essential properties of flexibility and vitality. Rubber checking, common to tires which have been in service for some length of time, is stopped immediately as the liquid flows into check cracks, according to the manufacturer.

Horn Rubber-Aid: Developed by the A. C. Horn Co., Long Island City, N. Y., this product is described as an elastic synthetic coating that prolongs the life of tire sidewalls, door mats, overshoes, auto floor mats and running boards, and garden hose. It is said to seal small cuts and bruises, keep out dirt, sunlight and moisture, retard deterioration, and to resist oils and gas. It is also said to be easy to brush on and to dry quickly without gloss. One pint will do five average size tire sidewalls both sides.

Rubber-Mend: A product of the Lange Co., De Pere, Wisconsin, this is a self-vulcanizing rubber putty, made especially for the maintenance of tires and tubes, that repairs rubber permanently. It requires no special tools or methods to apply, is used without heat, cures overnight, and when applied becomes an actual welded part of the tire or tube it repairs.

May Repeal Rubber Tax

A new revenue bill, known as HR-7378, has been passed by the House of Representatives and is now being considered by the Senate. This new bill contains a provision to repeal Section 3406 A-7 of the Internal Revenue Code, which is that portion of the Revenue Act of 1941 imposing a tax on rubber articles. It is believed that the revenue of the tax on rubber articles was far below initial estimates, and this, plus the fact that collection costs are far out of keeping with the amount collectible, is understood to lie behind the repeal provision in the new bill.

New Date for Chemical Exposition

Owing to the acquisition of the Stevens Hotel in Chicago by the Army Air Force, the Chicago Section of the American Chemical Society has announced that its Second National Chemical Exposition will be held at the Sherman Hotel. Although originally scheduled to be held from November 17 to 22, the exposition will take place from November 24 to 29. No changes are planned in the original program.

List of Abbreviations, Symbols, etc., Wanted

We have been asked by the War Department to furnish a complete list of abbreviations, contractions, symbols, signs, etc., used in the rubber industry and peculiar to that industry, together with their meanings, for use by the General Staff and the Intelligence Service.

We are now engaged in the compilation of that list, but in order that it may be as complete and comprehensive as possible and of the greatest possible use to the government, the aid of our readers in compiling the list is requested.

The rubber industry, of course, uses many abbreviations not common to other fields, such as Vulc. (vulcanization), Hexa (hexamethylenetetramine), DPG (diphenylguanidine), MR (mineral rubber), Acc. (accelerator), etc.

All lists of other data received from our readers in this connection will be collated and combined into a master list which will be turned over to the War Department. Please address all communications to the Editor, RUBBER AGE, 250 West 57th St., New York City.

Take Part of Skinner Plant

Part of the facilities of the Skinner Tire & Rubber Co. at Springfield, Ohio, have been taken over by the War Department, it was recently revealed. The Department, requiring additional space, asked the Skinner firm to surrender the property which readjusted its equipment to comply with the request. The Skinner company is owned by Jordan C. Skinner who purchased the property in 1934 at an auction held to liquidate the interests of the defunct Victor Rubber Co. The latter concern erected the factory buildings in 1906.

Two New Monsanto Chemicals

The Rubber Service Department of Monsanto Chemical Co. has introduced two new rubber accelerators — Thiotax (mercaptobenzothiazole) and Thiofide (dithio-bis benzothiazole). As reported in our previous issue the patents on mercaptobenzothiazole have expired and that material is now being sold by Vanderbilt, Du Pont and Naugatuck Chemical, in addition to Monsanto.

A repair service for rubber belts, hose, boots, aprons, gloves and other industrial products has been made available on a national basis by the Rubber Re-Nu Corp., 18 Murray St., New York City.

New Movies on Synthetic Rubber

Two new sound movies, both devoted to synthetic rubber production and use, have been released by the Standard Oil Co. of New Jersey. One film, entitled "Bouncing Molecules," in full color, portrays the manufacture of Buna N, Buna S and Butyl, molecular structure and polymerization being shown through the use of laboratory atom balls. This film also depicts scenes at the Esso Laboratories where the various synthetics are laboratory milled, compounded and vulcanized. Various tests, including those for determining tensile and resistance to solvents, are shown. The second film, in black and white, is called "Rubber Goes Synthetic," and is intended largely for consumer use. The replacement of natural rubber with the newer synthetics, particularly Butyl, is stressed, with the specific advantages of the latter material indicated. Both films are excellently done.

Chicago Holds Annual Outing

Approximately 120 members and guests attended the Annual Golf Outing and Dinner Dance of the Chicago Group, Rubber Division, A.C.S., held at the Lincolnshire Country Club, Crete, Ill., on June 27. The golf tournament was marked by the first presentation of the Charles Muehlstein Trophy, given to the golfer having the lowest gross score. It was won by J. T. Adams of Sears, Roebuck & Co. In addition to this trophy, many other prizes were distributed, all of which were made possible by donations received from the suppliers. The day's activities were topped off with dinner and dancing. James P. Sheridan (N. J. Zinc) was chairman of the outing, ably assisted by Al Stein (Muehlstein); Sam Davis (C. P. Hall), Ken Sidell (Salisbury), and Francis Frost, Jr. (Frost Rubber).

Form Seiberling Metal Products

The Seiberling Metal Products Co. has been organized at Wooster, Ohio, for the manufacture of metal casings for munitions. Machinery is now being installed and operations will start within the next few months. J. P. Seiberling, president of the Seiberling Rubber Co has been named president of the new company. T. K. Seiberling is vice-president and J. W. Dessecker is secretary-treasurer.

Form New Firestone Subsidiary

Formation of the Firestone Industrial Products Co., wtih P. P. Crisp as president, was announced by the Firestone Tire & Rubber Co. early this month. The new organization is said to simply incorporate all of the parent company's mechanical goods activities. Henry S. Brainard and B. M. Robinson were among the incorporators.

DUN & BRADSTREET REPORT ON RUBBER PRODUCTS SHORTAGES

In an effort to determine the effect of the war on purchases, sales, inventories and distribution policies in 1941, the research and statistical division of Dun & Bradstreet, Inc., recently made a survey of manufacturers and retailers. The results show how wartime shortages are affecting every American and indicate to an extent the direction in which other shortages may develop as the war progresses.

The accompanying tables summarize all instances of rubber products shortages reported by retailers in 17 states in 1941. Tires and tubes, both new and used, and tire repair materials were mentioned more often than any other type of rubber product. They constituted almost half of the instances of shortage reported. The proportion of reports that tires and tubes were "not available at all" was particularly large.

The number of statements that goods were available "only at high prices" was conspicuously small, except in connection with used tires and tubes. This is probably the result of the price ceilings on new tires and tubes.

More than half the stores in the automotive group reported shortages, accounting for nearly half the total number of instances. The proportion of shoe stores having difficulty in obtaining enough rubber footwear was even larger. For the nine important rubber-retailing trades as a whole, however, difficulty in obtaining rubber products was reported by only one store in every three.

MERCHANDISE SHORTAGES—RUBBER PRODUCTS

(Based on reports from 850 retailers in various trades received in the Dun & Bradstreet 1941 Retailers' Survey.)

Types of Product	Reported Instances of Merchandise Shortage	Degree of Difficulty (Percentage of Reported Instances of Merchandise Shortage) Not available at all %	Not enough %	Enough after delay %	Only at high prices %
All Types	1,331	44	37	12	7
Tires	317	77	19	3	1
Tubes	155	80	18	1	1
Tire repair materials	90	33	41	17	9
Recap & retread tires	44	45	41	5	9
Used tires and tubes	27	11	26	7	56
Rubbers and rubber boots	192	16	49	25	10
Rubber-soled shoes	23	30	61	—	9
Underwear	28	14	43	32	11
Other rubber apparel items	31	29	26	29	16
Rubber bands	40	62	25	3	10
Jar rubbers	28	36	46	14	4
Drug sundries	69	19	39	25	17
Hose	30	23	63	7	7
Misc. & unspecified	257	23	57	12	8

RUBBER SHORTAGES BY TYPES OF STORES

Types of Store	Proportion of all Reporting Stores, Percent *	Reported Instances of Merchandise Shortage No.	Percent	Principal Types of Rubber Products Reported Short
Shoe	68	80	6	Rubbers, boots, sports shoes
Variety	58	97	7	Toys, baby accessories
Automotive	53	568	43	Tires and tubes
Stationery	39	52	4	Rubber bands
Drug	38	79	6	Sick-room accessories
Dry Goods	33	46	3	Footwear
Clothing	25	80	6	Footwear, apparel
General (with food)	23	157	12	Footwear, tires
Hardware	14	71	5	Tires and tubes, hose
Sub-total	35	1,230	92	
All other	—	101	8	
All types	—	1,331	100	

* These percentages are computed by dividing the number of stores of each type which reported shortages in rubber goods by the total number of stores of that type submitting data. Percentages without significance are omitted.

Webflex Anti-Concussion Bandeau

One result of the European war has been the development of the Webflex Anti-Concussion Bandeau by Messrs. Walter Webb and Baker, Ltd., Monkwell St., London, E. C. 2, England. The bandeaus, made of Dunlopillo, give protection to the areas in the brain which are particularly sensitive to blast or concussion, at the same time protecting the ear drums against possible damage. They cover the frontal region of the skull, the temples, the ear openings, and extend back to the base of the skull, protecting the underlying brain. The protection offered by the new bandeaus lies in the use of Dunlopillo, each of the air cells in this material absorbing part of the shock, thus damping the full effect which would otherwise be transmitted direct to the brain through the flesh and skull bones.

File Anti-Trust Suit

A suit charging the General Tire & Rubber Co. with violation of the Sherman Anti-Trust Law and seeking to enjoin the company from using the Kraft System of retreading tires was filed by the Department of Justice in Federal Court at Cleveland on July 11. According to First Assistant U. S. District Attorney J. N. Curtiss, who filed the suit, the Kraft system requires use of the company's camelback only, the effect of which "has been to suppress and restrain competition in the sale of camelback."

An interesting novelty in the form of two blotters, one of which seems considerably larger when placed side by side but which are actually exactly the same size when placed one above the other, is currently being distributed by A. Schulman, Inc., Akron.

An attractive booklet describing the highlights of its 25-minute motion picture, "Keep 'Em Rolling," showing the importance of rubber in the nation's war effort, has been published by Goodrich. Copies are available on request.

Production executives will be interested in the series of production posters, designed to stimulate the war worker, now being created by Bressler Editorial Cartoons, Inc., 1475 Broadway, N. Y. The colorful posters are issued on the basis of one-a-week and may be displayed in special frames supplied by the company.

Johnstone Engineering & Machine Co., Downingtown, Penna., has issued a four-page folder briefly describing how its modern slitting, rewinding and uniform tension unwinding machines are being utilized for faster production of essential war materials. Copies are available on request to the company.

NEW LIFE-SAVING DEVICES DEVELOPED BY RUBBER FIRMS

Two new ingenious life-saving devices have recently been developed, one a one-man parachute boat by the U. S. Rubber Co., and the other a new type of life-saving suit by the B. F. Goodrich Co. Both were designed to cope with today's wartime sea hazards.

The parachute boat developed by U. S. Rubber is instantly inflatable, and is designed for emergency use on single-seater fighter planes. The total weight of the boat, including 11 items of vital equipment that help protect the flier, is only 12 pounds. It is attached to the pilot as a seat pack when he is in the plane, is held tightly to him in parachute descent, and can be inflated in from 5 to 10 seconds by turning a valve on a small CO_2 cylinder.

Orange-yellow in color for easy visibility, the boat is 5 feet 6 inches long by 3 feet 4 inches wide when inflated and only 14 x 15 x 4 inches when folded. Equipment includes two wire-reinforced paddles for propelling purposes, a concertina hand pump for maintaining required pressure, special plugs for sealing up bullet holes, a collapsible fabric bailing cup and a collapsible fabric sea anchor. In addition, the government furnishes a can of water and a sea marker for drawing attention for rescue purposes.

The life-saving suit developed by Goodrich has special construction which affords improved protection during long exposure. It is large enough to fit a man 6½ feet tall and weighs only a little more than 14 pounds. Weights are built into the soles of the boots to provide stability and maintain the wearer in an upright position when the suit is submerged. The suit has a yellow hood which can be easily seen at long distances but the garment itself is black so that it offers minimum attraction to fish.

Equipment includes knives for protection against predatory fish and a whistle to attract the attention of passing ships. A waterproof flashlight with a red lens is also fastened to the suit for use at night. The suit, large enough to cover a fully clothed man and which when used with a life preserver will keep the wearer afloat indefinitely, can be put on in half a minute and may be worn on shipboard as protection against wind, cold and spray. It has sufficient buoyancy to support a second person in the water.

Bulletin on Guayule

A bulletin or memorandum on guayule, summarizing current available information on that material, including its history, its value as a source of rubber, and the present government-sponsored program to develop it in the Salinas Valley of California, has been issued by the Rubber Manufacturers Association. The presentation is primarily intended to serve as valuable background factual material for editors and others preparing articles on guayule as further news develops and as a source of accurate information on this phase of rubber supply for members of the rubber manufacturing industry. A bibliography is included.

Status of Rubber Synthetics, Inc.

Since the announcement of the organization of Rubber Synthetics, Inc., at Gary, Indiana, there has been considerable confusion as to the ownership and function of that company, resulting largely from inaccurate news reports. We are now in a position to report the true facts, based on information received from W. B. Plummer, president of the company, as follows: Rubber Synthetics, Inc., was organized and is owned by Standard Oil Co. (Indiana), Sinclair Refining Co., and the Cities Service Oil Co. Its sole function is to build and operate a butadiene plant at Gary and its only connection with the styrene and rubber plants to be constructed in the same city is that the company was requested to build a boiler and power house and cooling water system large enough to take care of the entire project. Officers, in addition to Mr. Plummer, include E. W. Isom (Sinclair) and H. W. Camp (Cities Service) as vice-presidents; W. E. Brown (Sinclair), secretary, and V. B. Day (Cities Service), treasurer. General headquarters are in Gary, but an engineering office is maintained in Room 2014, 420 Lexington Avenue, New York.

Colonial Absorbs Seville Porcelain

The business and assets, including buildings, equipment and stock, of the Seville Porcelain Co., Seville, Ohio, have been purchased by the Colonial Insulator Co., Akron. The Seville plant will be remodeled and used for the manufacture of war products, according to Ray Hemphill, secretary of the Colonial firm.

The Goodrich life-saving suit is built to cope with today's wartime sea hazards. It is weighted at the soles.

U. S. Rubber's one-man parachute boat is equipped with special paddles for emergency use, as depicted in the above illustration.

NAMES IN THE NEWS

DR. H. I. CRAMER, of Sharples Chemicals, Inc., Philadelphia, Penna., presented a popular lecture on synthetic rubber at Harvard University on July 15. The lecture was given under the joint auspices of the Harvard Summer School and of the Boston and Cambridge Branch of the American Association of Scientific Workers.

H. H. BASHORE, until recently associated with the Dee's Flexity Stain Co., of Lynn, Mass., as development engineer, is now connected with the American Abrasive Metals Co., Irvington, N. J., as research chemist.

ARTHUR SURKAMP, treasurer of the U. S. Rubber Co., and P. L. HOCKMAN, assistant treasurer of the O'Sullivan Rubber Co., have been elected to active membership in the Controllers Institute of America.

JOHN M. MILLER, a production executive of the U. S. Rubber Co., until recently stationed at the Providence, R. I., plant, has been transferred to the Scioto Ordnance Plant in Ohio, which is being operated by the company for the government, as production manager.

HOWARD KARG, technical director, Master Tire & Rubber Corp., discussed the entire rubber situation before a meeting of the Rotary Club held at the Elks' home in Findlay, Ohio, on July 30. He described recent developments in the synthetic rubber field.

DR. DAVID SPENCE, noted American technologist and a Fellow of the Institution of the Rubber Industry (of England), has presented the Institution with a check for £15 (approximately $75) to be offered for the best essay on "Rubber in Relation to the War Effort, with Particular Reference to the Present Emergency." The competition is open to members of the I.R.I. only.

L. A. WOERNER, until recently associated with the Sponge Rubber Products Co., Derby, Conn., as a research chemist, is now affiliated with the U. S. Asbestos Division of Raybestos-Manhattan, Inc., Manheim, Penna., as a development engineer. His duties include the development of asbestos and rubber products.

JULIUS A. BERNINGHAUS, general manager of sales of the Organic Chemicals Division of the Monsanto Chemical Co., has been promoted to general manager of that division. He succeeds JOHN W. LIVINGSTONE, now associated with the Rubber Reserve Co. as a consulting engineer.

DR. E. C. WILLIAMS, an authority on the production of butadiene and other synthetic rubber raw materials, has resigned his position as vice-president and director of General Mills, Inc., to join the General Aniline & Film Corp., New York, in similar capacities.

CHARLES LEITER, of the Central Rubber Corp., Findlay, Ohio, addressed a meeting of the Findlay Lions Club on July 14. He outlined the rubber reclaiming process and discussed some of the newer synthetic rubbers.

HOWARD E. EAGLESTON has been elected a vice-president of the Essex Wire Corporation of Detroit. He will be in charge of the company's governmental relation department and will maintain headquarters in the Shoreham Building, Washington, D. C. He will also represent the Paranite Wire & Cable Corp., Jonesboro, Indiana, an affiliated concern.

C. GRANNISS BONNER, formerly comptroller and more recently treasurer of the Brunswick-Balke-Collender Co., Chicago, has been elected treasurer of the Pomona Pump Co., Pomona, Calif. The company is now operating four manufacturing plants.

NED H. DEARBORN, dean of the division of general education of New York University since 1934, has been named executive vice-president and managing director of the National Safety Council, succeeding WILLIAM H. CAMERON who retired after 30 years as managing director.

D. C. WOODS, formerly president of the Rollins Hosiery Mills, has been elected treasurer of the Pennsylvania Rubber Co., Jeannette, Penna., succeeding G. G. MORRILL, secretary-treasurer, who recently retired after 40 years of service.

In the Service

ALBERT K. DANNENBAUM, president of the Aldan Rubber Co., Philadelphia, has been commissioned a captain in the Army Quartermaster Corps and will be stationed at the Philadelphia Depot specializing in synthetic coated rainwear. HARRY M. DANNENBAUM, JR., will be in charge of the Aldan plant during CAPTAIN DANNENBAUM'S absence.

DAVID C. SCOTT, JR., of the Henry L. Scott Co., Providence, who recently entered the Navy, is now a lieutenant (J.G.) and is stationed at Fort Schuyler, New York.

Washington Appointments

Dr. Henry F. Palmer, formerly chief chemist for the Xylos Rubber Co., and more recently connected with the parent Firestone company doing special work on synthetic rubber, has joined the Rubber Reserve Co. as assistant to the president. He is in charge of operations for synthetic rubber plants.

John W. Livingstone has resigned as a vice-president and a member of the board of directors of the Monsanto Chemical Co. to join the Rubber Reserve Co. as a consulting engineer. He was general manager of Monsanto's Organic Chemicals Division and will participate in the synthetic rubber program.

Robert F. Bryan, until recently associate price executive of the Rubber Price Branch of OPA, has been appointed Price Executive of that branch, succeeding Ben W. Lewis who has become a special representative aiding in field price administration. Mr. Bryan has been active in the formation of rubber products price policies since he joined OPA more than a year ago.

Arnold H. Smith, who joined the Rubber Service Department of Monsanto Chemical Co. in 1922, spent the past ten years in England with the company's subsidiary, and more recently has been acting as manager of the company's petroleum products sales department in this country, has been loaned to WPB.

Simmons Joins Rubber Branch

Dr. H. E. Simmons, president of the University of Akron, has been named Associate Chief of the Rubber and Rubber Products Branch of WPB. He will head a new educational program to be undertaken by the branch and will have general direction over the technical aspects of the rubber program with particular emphasis on the uses of synthetic rubber. Dr. Simmons, in his new capacity, will attempt to disseminate as much information on the compounding and processing of synthetic rubber as possible to the rubber manufacturing industry at large. This will be accomplished by means of reports and manuals, in which effort he will be assisted by John Ball, formerly of the R. T. Vanderbilt Co., who has been serving with the Division of Civilian Supply. Dr. Simmons is on loan to the Rubber Branch and will spend about four days a week in Washington.

J. T. BLAKE, director of research for the Simplex Wire & Cable Co., Cambridge, Mass., was recently elected a Fellow of the Institution of the Rubber Industry (England).

FINANCIAL NEWS

U. S. RUBBER CO. REPORTS NET INCOME OF $1,554,841

Net income of $1,554,841 for the first six months of 1942 has been reported by the U. S. Rubber Co. This compares with $6,203,314 reported for the corresponding period of the previous year. Consolidated net income for the 1942 period before war loss provisions was $4,296,490 and after war loss provisions of $2,741,649 only $1,554,841 remained as net income. The report shows a provision of $8,886,477 for Federal income taxes under the 1941 law and a further provision of $3,220,000 for tax contingencies.

Consolidated net sales for the first six months of 1942 amounted to $130,814,895, a decrease of $19,862,844, or 13%, from the $150,677,739 reported for the 1941 period. Before deduction of taxes and reserves for tax contingencies and plantation losses, figured at $2,500,000, net income amounted to $17,500,589 as against $14,651,311 in the same period last year.

The consolidated balance sheet as of June 30, 1942, showed total current assets of $157,263,091, including cash of $34,472,623 (which in turn included government advances of $12,472,749 received in 1942), $30,466,938 in accounts and notes receivable, $28,277,663 in finished goods, and $32,437,239 in raw materials. Total current assets as of December 31, 1941, amounted to $154,814,838, including cash of $29,135,931. Total current liabilities at the end of the 1942 period amounted to $71,457,051, as compared with $66,464,919 at the 1941 year-end.

In making the report public, F. B. Davis, Jr., president and chairman of the company, announced that shipments of war products by U. S. Rubber during the first six months of 1942 were more than three times as large as those for the corresponding 1941 period. During the 1942 period, Mr. Davis said, the company was awarded government contracts to operate seven additional war plants, bringing to nine the number of war factories now under the company's management. Included in the new assignments were plants for the manufacture of synthetic rubber, ammunition, explosives, and the loading of shells and fuses.

Pointing out that all of the company's rubber plantations are now in enemy occupied territory, Mr. Davis stated that it had been tentatively decided to eliminate the four plantation subsidiaries and other investments now in enemy hands as component parts of the consolidated statements, to show separately the net investment in such properties, and to provide a reserve of $2,500,000 from current earnings for the six months for estimated losses on the plantations.

Of the $14,838,949 net investment in plantation subsidiaries, Mr. Davis said, $961,196 is not in enemy occupied territory, this latter amount being represented by $2,110,098 of cash in London, less all known current plantation liabilities of $1,148,902. He also stated that in view of current conditions action on dividends has been postponed.

General Tire & Rubber Co.

Six Months Ended May 31: Net profit of $642,210, after provision of $650,000 for Federal income and excess profits taxes, equal after preferred dividend requirements to $1.09 each on 527,147 common shares, which compares with $1,004,443, after tax charges of $850,000, or $1.77 each on 526,847 common shares, reported for the corresponding 1941 period. Net sales amounted to $13,591,741, as compared with $16,391,801 in the 1941 period.

N. J. Zinc Company

First Half: Net profit of $4,444,318, after all charges and contingencies, equal to $2.26 each on 1,963,264 shares, which compares with $5,513,900, or $2.81 a share, reported for the first six months of 1941. Net profit for the quarter ended June 30, 1942, amounted to $2,152,984, or $1.09 a share, against $2,700,391, or $1.37 a share, in the second quarter of 1941.

Anaconda Wire & Cable Co.

First Half: Net income of $865,043, after all charges and taxes including $6,248,936 for excess profits taxes and $125,000 reserve for tax contingencies, which is equal to $2.05 each on 421,981 shares of capital stock outstanding. This compares with $1,410,519, or $3.34 a share, in the similar period last year.

Rome Cable Corporation

Second Quarter: Net profit of $65,898, after provision of $219,376 for normal and excess profits taxes, equal to 34c a share, which compares with $120,734, after deduction of $162,599 for taxes, or 64c a share, in the corresponding 1941 quarter.

Mansfield Tire & Rubber Co.

First Half: Net profit of $327,682, after provision of $217,000 for Federal taxes, equal to approximately $1.95 per share of common stock after preferred dividend requirements. This compares with a loss of $2,966 reported for the first six months of 1941.

GOODYEAR NET IS $4,123,961 BASED ON 17% SALES INCREASE

Based on consolidated net sales of $179,755,599, an increase of 17% over the same period in 1941, the Goodyear Tire & Rubber Co. reports a net profit of $4,123,961 for the first six months of 1942. The increase in sales in the face of sharp declines in the company's normal rubber business reflects the extent to which the company's production of war materials has increased.

The net profit of $4,123,961 was reported after depreciation, interest, dividends and equity in the undistributed earnings of subsidiaries not wholly owned, Federal and foreign income and excess profits taxes, a provision of $1,500,000 for contingencies and a reserve of $6,751,247 for Far Eastern losses. This is equivalent to $1.24 each on 2,059,168 shares of common stock, excluding treasury shares, after dividend requirements on the $5 preferred stock. For the first half of last year the company reported a net income of $6,196,756, after charges and a contingent reserve of $3,500,000, or $2.23 a share, on the common stock.

Deductions for income and excess profits taxes for the first six months of this year amounted to $12,008,724, against $11,483,840 in the corresponding period of last year. The Federal tax provision was made on the basis of the House Revenue Bill of 1942, with an estimated allowance for a tax credit arising from losses on the company's Far East investments.

The company reports that net profits of foreign subsidiaries, in the six months to June 30, amounting to $2,437,000, are incorporated in the consolidated earnings statement that $2,060,119 was received from these subsidiaries in United States dollars. In the same six months of 1941 net profits of these subsidiaries were $1,980,416.

According to the statement, as a result of enemy action, the company's net investments in Singapore, Sumatra, Java and the Philippines have been taken out of the component parts of the consolidated statement and grouped in the balance sheet under a separate caption. With reserves previously accumulated from earnings and by a further charge to current earnings, the company now has provided a full reserve for these Far East investments.

Current assets, as of June 30, amounted to $146,778,815 and current liabilities were $34,888,034, against $133,039,488 and $31,275,468, respectively on June 30, 1941.

St. Joseph Lead Co.

First Half: Net profit of $2,142,208, after provision for Federal income and excess profits taxes, equal to $1.09 each on 1,955,680 shares of capital stock, which compares with $2,518,957, or $1.29 a share, reported for the first half of last year.

LOS ANGELES NEWS

Extensive enlargements are in progress on the plant of the Plastic and Rubber Products Company at 2100 Hyde Park Boulevard. This company, which makes both rubber and plastic molded goods, is owned by N. O. Hulsey and MacNeel Pierce, both well known in the rubber industry in southern California.

V. S. Anderson, who was associated with the firm, has sold out his interest and established his own company and plant (see below).

The frame and stucco building occupied by the Plastic and Rubber Products Company stands back some distance from the street. Now the building is being enlarged and when completed will be flush with the sidewalk. More than 9,000 square feet of floor space is involved.

Being added to the equipment is a complete tool and die shop, a large increase in the present rubber manufacturing equipment, a complete new plastics department, and a complete compression and injection molding department. The investment runs around one hundred thousand dollars. More than seventy employees are already on the payroll.

V. S. Anderson, formerly part owner of the Plastic and Rubber Products Company, has established his own factory at 6620 McKinley Avenue. The new plant has between 4,000 and 5,000 square feet of floor space and the new company name is the Pacific Moulded Products Company. Both rubber and plastic molded products are already being manufactured. The machinery set-up is new throughout and complete for a good start. Mr. Anderson's father, G. P. Anderson, formerly in the truck selling game in Los Angeles for a score of years, is in charge of the office.

The Caram Manufacturing Company, whose main plant is located at 1227 E. 63rd Street, has added two new brick buildings to its physical set-up, one at 55th Street and Avalon Boulevard with 6,000 square feet of floor space, and the other at 88th Street and Crocker Avenue with 7,000 square feet of floor space. The investment runs above $29,000. Several new machines have been installed and work has already started in the new buildings.

E. D. Caram, the owner, states that the enlargement has been necessary to take care of the greatly increased volume of defense business. Up until the war effort started this company devoted practically all of its capacity to the manufacture of rubber soles and heels for shoes and cement used in shoe manufacture.

The Kirkhill Rubber Company, which recently took over a large one-story brick building directly across the street from its main plant on Hoover Street, has installed a large recreation room for employees and a garage for employees' cars. The recreation room is equipped with pool tables, card tables, ping-pong tables, etc. The garage has complete mechanical and lubricating equipment. Business at the Kirkhill plant is flourishing with three shifts running the clock around six days in the week.

Paul Beebe, Goodyear chemist who was president of the Los Angeles Rubber Group back in 1934 but who has been located in Akron for several years, visited the local plant in early August. This was his first trip back to Los Angeles since leaving.

It is reported here that Gabriel ("Gib") G. Balazs, Goodyear rubber chemist who has been in England for several years but who has been spending part of the summer in America, is about to return to England to take up his work again in the company's plant in that country. Local friends were hoping Gib would find his way clear to visit Los Angeles before returning. He was president of the Los Angeles Rubber Group back in 1936.

The Los Angeles Standard Rubber Company, 1580 E. Slauson Avenue, continues its program of plant expansion to meet a rapidly growing business. Some new buildings are being constructed at Compton and Gage Avenues in the Huntington Park area which will add 6,000 square feet to the plant as a whole. These are frame and stucco buildings. A new Span grinder has been installed in the last few weeks as well as some new mills and presses. Thirty more employees have been added in the last month or two giving a total at this date of more than 150.

Edward L. Royal, local manager for H. M. Royal, Inc., has received word from his son, Stokes Royal, who is in the American Field service in North Africa as an ambulance driver. The young man took part in the evacuation of Tobruk. Only a few seconds after he and a friend had stepped out of the ambulance they were driving it was hit by a bomb and demolished. The word came from Cairo where the young man probably is at the present writing.

"I never like to underrate the chemical industry," was the remark of F. B. Davis, Jr., president of the United States Rubber Company when in Los Angeles this month. American chemical ability has outclassed the German, he stated, and can be trusted to do the job of producing synthetics in quality and amount to meet all needs if given time. Mr. Davis urged that the public reduce its use of automobiles to sheer essential use, and keep the speed definitely down. Then, he said, there ought to be tires enough to go around. He had a word to say also on the careful storage of tires insisting that tires properly stored away from light and air do not show deterioration for several years. He cited improvements in rayon and other synthetic fabrics as classical examples of what American science can do in the field of synthetics when it puts its mind to it.

Charles Lamb, Sr., vice-president and general manager of the West American Rubber Company, reports that his wife who has been in a hospital for more than nine weeks at this writing is much improved but still very ill.

Charles Churchill, who formerly was in charge of the office of H. Muehlstein and Company, Inc., in Los Angeles, but who was transferred to Akron a while back, was in the Los Angeles area again in August greeting his old friends in the industry. Bert E. Biheller is now in charge of the company's office here.

I. D. Blumenthal, president of the Golden State Rubber Mills, Ltd., has been spending several weeks in Los Angeles. The company is doing more and more war work.

Set Up Conservation Department

A Tire Conservation Department to help conserve rubber and render tire consultant service to truck fleet operators has been formed by the B. F. Goodrich Co., Akron, and John T. Staker made manager. Contracts are negotiated with truck fleet operators and a service fee is based on the number of vehicle miles run, according to James J. Newman, company vice-president. Conservation of rubber as one of the contributions to the war effort is included among the functions of the new department.

Will Operate New War Plants

Receipt of contracts from the War Department for the operation of two ordnance plants in Wisconsin has been announced by the U. S. Rubber Co. This brings to six the number of ordnance facilities which the company has been authorized to operate. Under the various contracts, U. S. Rubber will make ammunition and explosives, and load shells. The company has also announced plans for the construction of a new factory at Hogansville, Georgia, for the exclusive manufacture of asbestos yarns and fabrics.

CANADIAN NEWS

No definite announcement has yet been made about the source of the alcohol which will be used in Canada's synthetic rubber program.

Recently it was revealed that approximately 6,000 tons of the proposed 34,000 ton annual production of Buna S rubber will be manufactured from butadiene obtained from alcohol rather than from petroleum. This represents a change in the original plans which called for use of refinery gases only.

It is probable that Canada's present distilling industry will be called upon to supply the necessary alcohol from grain as it would not be a sound move to erect new plants for the fermentation of grain at this time.

Eventually, the total output of the Dominion's synthetic rubber industry is expected to be 40,700 tons annually. First production from the $44,000,000 program is scheduled to start in the second half of 1943 and it is hoped that 14,000 tons will be produced next year.

Dr. Norman S. Grace, chief chemist of the Dunlop Tire and Rubber Goods Company, Ltd., Toronto, has been loaned to the Dominion government for several months. Dr. Grace will be connected with the Polymer Corporation, Ltd., and will be stationed in Washington in order to follow closely the ever new developments in synthetic rubber production.

By recent order of the Transit Controller, special buses will no longer be permitted to carry soldiers between Camp Borden and Toronto. Rubber conservation is the purpose of the new order.

The mayor of Granby, Quebec industrial center, is no grey-bearded veteran of the political wars. Instead he is 36-year old Horace Boivin who is also president of Granby Elastic Web of Canada, Ltd.

When elected to the mayoralty in 1939, young Boivin was following in the footsteps of his father. The elder Boivin, founder and, until his death in 1938, president of the web company, served as mayor of Granby from 1915 to 1934.

In spite of rubber restrictions the business of the company has continued to expand steadily in recent months. At the present moment a 6,000 square foot addition is being made to the plant in order to cope with new orders. Nearly ninety per cent of the company's output is on government orders for web equipment for packsacks and haversacks, camouflage nets, canvas and other articles required by the armed services.

The late Mr. Boivin, founder of Granby Web, started life as a cobbler. Being gifted with imagination, he got into the business of attaching "creepers" to overshoes. This device, intended to prevent the wearer from slipping on ice, required a special type of rubber webbing. At first this material was imported from England, but as the business expanded he decided to manufacture his own webbing. Aided by two partners and machinery imported from the States he started the company which is now the principal webbing manufacturer in the Dominion.

When Horace Boivin left Mt. St. Louis College, in Montreal, he started as a mill hand and then worked through all departments. Until he succeeded to the presidency in 1938 he had served as export sales manager for a number of years.

In addition to operating Granby Elastic Web, the younger Mr. Boivin is president of Everlastic Corporation of Canada, Ltd., and of World Wide Chewing Gum, Ltd., and is a director of W. A. Fortin, Ltd. He is also director in charge of narrow fabric and surgical bandages for the Wartime Prices and Trade Board. His civic life, likewise, has been many-sided. In addition to serving as mayor of Granby he has been president of the Board of Trade for the past three years during which time fourteen new industries have located in the town. He is also vice-president of the Eastern Townships Associated Boards of Trade, organizer and president of the Quebec Provincial Senior Hockey League, founder of the Aramis Club, and honorary lieutenant-colonel of the Chateauguay Regiment.

New Types of Neoprene

The Rubber Chemicals Division, E. I. du Pont de Nemours & Co., Inc., Wilmington, Delaware, has introduced two new types of neoprene, *i.e.*, Neoprene Type KNR and Neoprene Latex Type 571. Neoprene Type KNR is a new type of polymer which replaces Type KN. Although it is made by the same basic process, slightly modified, as that used for the manufacture of Type KN, it is tougher and possesses, in general, better physical properties. Type KNR is especially recommended as a replacement for Type KN in protective coating and tank lining applications. Neoprene Latex Type 571 is a slightly modified version of Type 57 and may be substituted for the latter in practically every application. Special laboratory reports describing each of the new neoprene types are available.

Poster Stimulates Collections

The accompanying reproduction is of a four-color poster issued by A. Schulman, Inc., Akron, authorized agents for the Rubber Reserve Co. on scrap rubber, which is being used extensively to help the current government drive for scrap. Reports received from dealers and factories throughout the country indicate that it is an active stimulant to the collection campaign. Copies of the poster, which is 21 x 32¼ inches in actual size, may be secured from the company on request. Individual names are imprinted in the top panel. In addition to its general headquarters at Akron, Schulman maintains warehouses at East St. Louis, Ill., and Boston, Mass.

Whitby Joins Akron University

Dr. G. Stafford Whitby, noted British and Canadian rubber technologist, author of several books on plantation subjects, has joined the University of Akron as Professor of Rubber Chemistry and Director of Chemical Research in the field of rubber. Dr. Whitby will take up his new duties in September. It was also learned that James W. Schade, who retired as director of research for Goodrich several months ago, is now connected with the university and will give a course of lectures beginning in September to technical men employed by Goodrich, Goodyear and Firestone. The courses given by each of these companies to new technical employees to orient them into the industry have been pooled and will now be given by Mr. Schade.

General Cable Corporation

Second Quarter: Net income of $421,570, which compares with $1,049,216 reported for the corresponding period last year. Gross profit from sales amounted to $4,874,798 as compared with $3,437,557 in the 1941 period.

OBITUARIES

Henry G. Knight

Dr. Henry Granger Knight, head of the Bureau of Agricultural Chemistry and Engineering of the Department of Agriculture for the past 15 years, died in Washington of a heart ailment on July 13 at the age of 63.

Born in Bennington, Kansas, Dr. Knight took his bachelor's and master's degrees at the University of Washington and in 1917 received his Ph.D. in chemistry from the University of Illinois. After teaching chemistry for several years, he became state chemist in Wyoming and then dean of the Oklahoma Agricultural and Mechanical College. Later he became dean of the College of Agriculture of West Virginia. In 1927 he was appointed chief of the Bureau of Chemistry and Soils of the Department of Agriculture, now the Bureau of Agricultural Chemistry and Engineering.

In May, 1941, he received the medal of the American Institute of Chemists for "noteworthy and outstanding service to the science of chemistry." The medal was presented on behalf of the Institute by Vice-President Henry Wallace. Dr. Knight was a past president of the Institute, a Mason, and a member of the American Chemical Society.

Funeral services were held in Washington on July 14, with internment in Wichita, Kansas, the family home. A widow and son survive.

Richard H. Evans

Richard H. Evans, purchasing agent for the Master Tire & Rubber Corp., died at his home in Findlay, Ohio, on July 9. Death was due to heart trouble from which he had been ailing for about two years, being practically bedfast for the past year. He was 54 years of age.

Born in Arcadia, Ohio, Mr. Evans lived in Findlay practically all of his life, with the exception of a few years spent in Cuyahoga Falls when the offices of the Cooper Corporation were moved to that town. He was affiliated with Master Tire for seventeen years in all, first as purchasing agent for the Cooper firm and later with Master Tire after it was organized. Cooper is still operated as a division of the Master Tire organization.

Mr. Evans was a veteran of the last World War, having served with Company 1, 329th Infantry, overseas for a year. He was a 32nd degree Mason and a lifelong member of the Methodist Church. Funeral services were held on July 11, with internment in Maple Grove Cemetery, Findlay. He leaves a widow and a daughter.

Newell B. Parsons

Newell B. Parsons, who retired as vice-president of the Belden Manufacturing Co., manufacturers of insulated wire and other products, several years ago, died at St. Luke's Hospital in Chicago on July 16. Mr. Parsons started with the company as its first salesman in 1904 and was made a vice-president the same year. He retired from the company's board of directors last March after thirty-seven years of service. Mr. Parsons lived in La Grange, Ill.

Protektol, a liquid film which may be sprayed on metal, glass, ceramic and other surfaces, protecting such surfaces from damage of any kind during various stages of manufacture, storage or shipment, has been introduced by the Ault & Wiborg Corp., Cincinnati. The new material cannot be used on porous surfaces.

—

A reprint of the article on "A Study of Profit and Tax Problems in the Rubber Industry," which appeared in the August, 1941, issue of RUBBER AGE, has been published by the George S. May Business Foundation, 2600 North Shore Ave., Chicago, Ill. 125,000 copies of the reprints were distributed.

—

A well-compiled and complete pamphlet on the "Cleaning, Repairing and Storage of Household Rubber Goods," by Helen G. Wheeler, has been made available by the Division of Textiles and Clothing, Bureau of Home Economics, Department of Agriculture, Washington, D. C.

—

Wilmington Chemical Corp., manufacturers of Naftolen and other materials, recently established a New York office at 10 East 40th Street. The laboratory, as well as the plant, remains in Wilmington, Delaware.

—

Plans for the immediate erection of a plant that will substantially increase supplies of ammonia and its derivatives have been announced by the Mathieson Alkali Works, Inc. It will be financed by the Defense Plant Corp. and operated by the company.

—

Headquarters of the Rubber Trade Association of New York, Inc., of which B. G. Davy is secretary, are now located in Room 1121 at 15 William St., New York City. The new office adjoins that of the distributing agent for the Rubber Reserve Co.

Cotton Protector for Tubes

A new cotton cord protector for inner tubes that is expected to add thousands of miles to many old tires already pronounced unfit for use has been developed by the Firestone Tire & Rubber Co., Akron. Although the device bears marked resemblance to the feminine girdle, its purpose is not to enhance

the smooth symmetry of the tire's appearance, but to insulate and protect the tube against the chafing action of broken or otherwise damaged inside plies in the cord body of the tire. The "girdle" contains no rubber and is shaped in a full circle to fit snugly and neatly around the tube. In one test of the "girdle" a worn and slashed tire, already condemned for use, was run under excessive flexing conditions for an additional distance of 4,055 miles before failure occurred. The accompanying illustration shows the cotton cord protector around a tube prior to inserting in the tire.

The use of nylon in tire cord is covered in U. S. Patent No. 2,273,000, awarded to G. P. Hoff and assigned to du Pont. Because of its high tensile strength nylon is believed especially practical for airplane tires.

—

An Ameripol compound for use in the manufacture of rubber hand stamps has been announced by Goodrich. It has a durometer reading of 55, specific gravity of 1.22, and cures in 10 minutes. An all-reclaim compound for the same use has also been developed.

—

Marathon Chemical Co., Rothschild, Wisconsin, manufacturers of lignin products, is conducting experiments on the use of lignin as an extender for rubber and synthetic rubber. Lignin in limited amounts is already being used commercially.

—

The fleet of Goodyear blimps which have become a common sight in various parts of the country has been commandeered by the U. S. Navy. Five blimps in all were involved in the transaction.

CALCENE

MAKES RUBBER GO FARTHER

Calcene is a re-inforcing Calcium Carbonate pigment of extremely fine particle size. For eight years it has proved its value in making a limited quantity of rubber go farther in terms of finished goods. With today's rationing of rubber, Calcene can be more useful to you than ever.

Among virtually all the materials in its class, Calcene can be loaded at the highest volume with the least deterioration in physical properties. It assures highly loaded stock of low volume cost but with excellent resistance to tear, abrasion and flex cracking.

As supplementary fillers for stiff stocks we suggest the use of clay along with Calcene. For better grade stocks, Silene is recommended.

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It's not a substitute for the now unobtainable Italian pumice but is chemically and physically equal in every respect. Note its comparison.

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Silica	72.90	73.24
Alumina	11.28	10.61
Iron Oxide	.86	1.57
Titanium Oxide	.06	.10
Calcium Oxide	.80	1.10
Magnesium Oxide	.36	.40
Soda	3.64	3.03
Potash	4.38	5.58
Sulphuric Anhydride	.03	.05
Loss on ignition	5.20	4.04

Valencia is a true pumice stone and not a volcanic ash.
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2613

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Perhaps you have become accustomed to the unpleasant odors imparted to finished goods by many synthetic rubber compounds, but your prospective customers have not! When there's a choice to be made, it is only natural that the sale will go to the cleaner-smelling product.

Yet it is surprisingly easy and economical to overcome disagreeable odors in synthetic rubber compounds. Simply add small quantities of Givaudan's deodorants or reodorants to your formulas. Manufacturers have found that the results are not only highly satisfactory, but are permanent as well. Givaudan has had a wealth of experience in making odor-masking compounds, experience that will enable us to give your products a clean, *saleable* odor.

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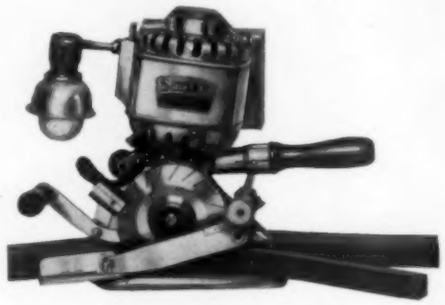
Industrial Aromatics Division

330 WEST 42ND STREET, NEW YORK, N. Y.

NEW EQUIPMENT

Simplex Portable Rubber Strip Cutter

A machine capable of stripping slab rubber up to 1 inch thick at the rate of 10,000 feet in approximately 8 hours, any desired width, has been introduced by the Simplex Cloth Cutting Machine Co., Inc., 270 West 39th Street, New York City, under the name of the



Simplex Portable Rubber Strip Cutter. The new strip cutter cuts within a tolerance of 1/64-inch and in some grades of rubber to 1/100-inch. Tolerance is determined by micro-adjustment of the gauge on the machine. The device can cut a slab of rubber down to the last shaving, according to its manufacturer, thereby eliminating waste. It cuts squarely, with no rejects, and can be used to trim conveyor belts in the uncured stage. Special features of the strip cutter, cited by the manufacturer, include a micro-adjustment for accurate widths, slotted knife which carries water to the cut and insures a smooth surface, water tanks which feed water to the knife and to the cut, repulsion-induction motor which carries any overloads, and an automatic sharpener device which keeps the knife keen and sharp. The unit's base is equipped with rollers for easy handling.

New Line of Temperature Controllers

A new line of temperature controllers, entirely self-contained and self-operating, has been announced by the C. J. Tagliabue Mfg. Co., Park and Nostrand Avenues, Brooklyn, N. Y.

TAG Self-Operating Controllers are used extensively on many different types of applications such as hot water storage heaters, hot water storage tanks, canning retorts, exhaust boxes, textile dryers, scouring bowls and numerous other applications.

AIR BAG BUFFING MACHINERY
STOCK SHELLS HOSE POLES
MANDRELS
NATIONAL SHERARDIZING & MACHINE CO.
868 Windsor St. Hartford, Conn.
Representatives: Akron San Francisco New York

This controller uses no power outside of the energy developed in its own system. The temperature changes at the sensitive element or bulb in the apparatus under regulation, raises or lowers the vapor pressure of the volatile liquid in the tube system. A capillary connecting tube transmits the pressure change to the power bellows. The bellows expand and contract in response to the temperature changes at the bulb, position the steam valve and so control the temperature.

Jewett Cold Treater Refrigerator

A new industrial type sub-zero cold treater refrigerator, which maintains temperatures down to —35° F., has been placed on the market by the Jewett Refrigerator Co., Inc., 2 Letchworth St., Buffalo, N. Y. It may be used for laboratory research and testing, and production processing, aging, manufacturing and

assembly. It finds specific application in the rubber laboratory.

The new Jewett refrigerator is built in three and six-cubic foot capacities. It is equipped with self-contained, trouble-free sealed condensing units, ready to plug in and use. A large single lid gives complete access to the interior. A standard control on the unit maintains temperatures from +5 to —10° F., while a special control provides temperatures from +20 to —35° F.

Various types of shelves and containers for the interior of the new cold treater refrigerator are available from the manufacturer to suit individual requirements.

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An Effective and Economical PLASTICIZER
For Synthetic and Reclaimed Rubber
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The Beacon Company
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BIN-CURE
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CRYSTEX
insoluble
SULPHUR

CRYSTEX has recently demonstrated its ability to prevent bin-cure and dryness which usually occur when a reclaim compound is used.

CRYSTEX is an amorphous sulphur especially prepared to prevent bloom in uncured rubber stocks.

CRYSTEX should be used in place of rubbermakers' sulphur where repair treads or retreads are put up without a cushion. Where a cushion is put on the tread, and Holland on top of the cushion, it is only necessary to employ CRYSTEX in the cushion.

Write to our nearest office for a working sample and complete information on CRYSTEX (insoluble) Sulphur.

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Guard Rubber Goods against Oxidation

Here's a way makers of rubber goods are helping conserve rubber: A shop-coating of a special wax finish (formulated by the makers of Johnson's Wax) retards deterioration by preventing oxidation.

On a wide variety of rubber articles these special Johnson's Wax Finishes have been used with great success. The finishes are easy to apply, water repellent, non-flammable. And their protective, non-porous coating gives rubber surfaces a long-lasting lustre.

A gallon of Johnson's Wax Finishes covers 2,000 feet, or higher. These economical dressings may be applied by dipping, spraying or wiping. Available in 5 and 55 gallon drums. Also in 1 gallon containers.

For samples and further information, write

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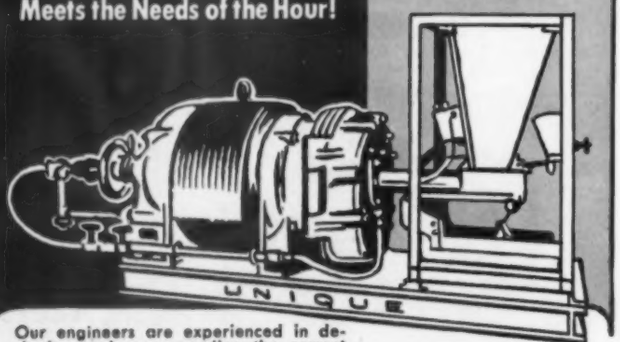

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Detailed manuals available on any of above listed units.

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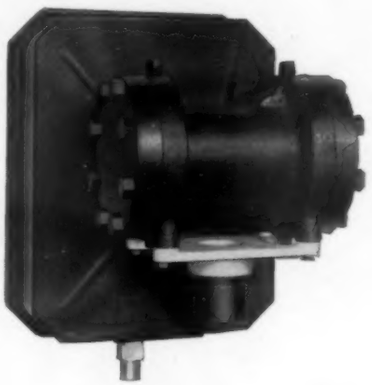
Taylor Aneroid Manometer

The absence of mercury or other liquid from a new Aneroid Manometer developed by the Taylor Instrument Companies, Rochester, N. Y., removes the possibility of product contamination and the hazard of



mercury being blown due to line surges or carelessness. Further advantages are that sealing liquids are rarely required and vital mercury is released for the war effort.

Replacing the stuffing box is a new torque tube assembly which gives a completely closed system and is designed so as to eliminate friction and lubrication. This new assembly also does away with the lost time involved in maintenance. Friction, lost motion and wear are further reduced by the absence of internal pivots and springs.

Metal bellows respond to the pressure variations and insure faster response under ordinary circumstances with immediate reaction to sudden changes in flow. The sturdy bellows are built to withstand high overrange without damage.

Under steady flow conditions the Taylor Aneroid Manometer is accurate within 1% of scale range. It is available for all types of indicating and recording meters and controllers and is supplied for standard ranges between 20 and 500 inches of water. The range can be changed right on the job by substituting precalibrated torque tubes.

New Horizontal Hydraulic Pump

A 6-plunger, fully enclosed, horizontal hydraulic pump has been added to the line featured by the Charles F. Elmes Engineering Works, 229 North Morgan St., Chicago, Ill. The pump is modern in appearance and embodies the latest principals of design and construction. All moving parts are pressure lubricated and connecting rods run in a continuous bath of oil. Roller bearings are used throughout.

Maximum capacity of the pump is 400 horsepower. Herringbone gears, running in a continuous bath of oil, are used for driving the pump, insuring long gear life. The compact arrangement of the pump is a space saver, and it is particularly adaptable for accumulator systems. The pump can be equipped with built-in bypass valves or safety valves, as may be desired.

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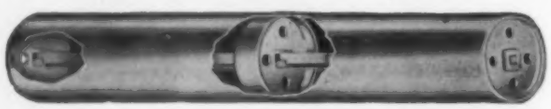

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CADIZ, OHIO

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CARTER BELL 1903 RUBBER SUBSTITUTES

Springfield New Jersey

REVIEWS

BOOKS

Patents and Industrial Progress. By George E. Folk. Published by Harper & Brothers, 49 East 33rd St., New York City. 5½ x 8½ in. 393 pp. $3.00.

Coming as it does when the entire patent structure of the United States is facing complete overhauling, as a result of an intensive investigation being made by a special committee of the Senate, this book should prove doubly welcome to manufacturers, inventors, designers, and others to whom the issuance of patents means profit or loss.

The book deals with the recent testimony presented before the Temporary National Economic Committee. During these hearings voluminous testimony was presented covering practically every phase of the patent system. This testimony is summarized, analyzed and evaluated by the author who has had more than forty years of intimate experience with the American patent system. He is also special patent adviser to the National Association of Manufacturers.

The cases presented to TNEC by both the Department of Justice and the Department of Commerce, and the recommendations made by the investigating committee for legislation based on the proposals submitted by the government departments, are included. In all, the book is divided into seven parts, includes a list of cases cited, and is complete to a subject index.

BOOKLETS, CATALOGS, Etc.

A Study of Carbon Blacks in Natural and Synthetic Rubbers. United Carbon Co., Charleston, West Virginia. 14½ x 9 in. 53 pp.

This report, which was presented orally and visually to members of the rubber industry at technical sessions held in Charleston during July, contains a comparison of natural and synthetic rubbers by means of carbon black. The synthetic rubbers studied included various grades of Buna N and Buna S, Butyl B, Thiokol RD and Thiokol N, and Neoprene GN. The carbon blacks included Kosmobile S-Dixiedensed S, Kosmobile 77-Dixiedensed 77, Dixie 40-Kosmos 40, Dixie 20-Kosmos 20, P-33, and Thermax. Special blacks included were B-5 lamp black and acetylene black.

The study is the most complete made available to date on the effect of carbon blacks on synthetic rubber compounds. Complete and detailed data, including formulas, test data, charts and graphs, is given. Test methods and procedures used are outlined in an appendix. The study definitely indicates that the synthetic rubbers, by themselves, are quite different from natural rubber and also differ from each other. The effect of carbon black is most pronounced in Buna S and least in Butyl B. One conclusion

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drawn from the study is that synthetic rubbers require, even more than natural rubber, the use of carefully selected blacks to produce best results.

The United Carbon Company distributed copies of the study to those attending the sessions at Charleston. A limited number of additional copies is available. Requests should be addressed to Dr. I. Drogin, director of research.

•

Monsanto Chemicals. (26th Edition). Monsanto Chemical Co., St. Louis, Mo. 6 x 9 in. 170 pp.

This is one of the most useful and informative chemical trade catalogs published. It contains chemical names, trade names, formulas, standard forms or grades, uses, general information, and available special literature on all of the several hundred chemicals and plastics manufactured by Monsanto, the total of which grows larger each year. A general technical section includes tables of physical constants for some of the more common chemicals. So much additional information has been included, that the current edition of this catalog is almost exactly three times larger than the previous edition, in both number and size of pages.

•

The House of Stearns Magnetic Magic. Stearns Magnetic Mfg. Co., Milwaukee, Wisc. 8½ x 11 in. 8 pp.

This brochure is an informative treatise on the subject of magnetic separators and magnetic separation. It explains the subject of separations, concentration, reclamation and purification of materials by magnetic separation methods and outlines the advantages of various types of separators, describing their most efficient and profitable use.

•

The Job Is Being Done. Automotive Council for War Production, New Center Building, Detroit, Mich. 8½ x 11 in. 32 pp.

Covering the war production progress of the automotive industry since Pearl Harbor, this colorful booklet, replete with photographs, represents the industry's report to the nation. Progress in the manufacture of guns and shells, tanks, aeronautical equipment, military vehicles and other war products now being turned out in plants formerly devoted exclusively to the manufacture of automotive equipment is reviewed. The booklet is ample evidence that "the job is being done."

•

Rubber-Tired Equipment of Principal Farm Machines. By A. P. Brodell and R. A. Pike. Issued by the Bureau of Agricultural Economics, Department of Agriculture, Washington, D. C. 8 x 10½ in. 8 pp.

This report summarizes information collected last year on the use of rubber tires on tractors and some other farm machines. The data was supplied by more than 25,000 crop correspondents who reported on machines for their locality and on more than 17,000 tractors on their own farms. The reports provided complete information as to the age and type of the tractors and the extent of the use of rubber tires for more than 13,000 tractors.

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MARKETS

Rubber – Crude, Reclaimed and Scrap – Cotton – Ducks – Tire Fabrics – Sheetings

NEW YORK, AUGUST 12, 1942

Crude Rubber

THE possibility of increasing supplies of crude rubber from South and Central America continues to improve, as the Rubber Reserve Company swings into full stride in its ambitious program. The signing of special agreements with Bolivia, Mexico, Ecuador, and Honduras brings to nine the number of such arrangements. Like the previous ones, the latest agreements call for the purchase by Rubber Reserve of all rubber produced in the various countries other than that needed for domestic purposes. Although the contracts follow a similar form, they vary slightly as to prices and concessions granted.

Based on the expert testimony of several government officials, including J. W. Bicknell, formerly managing director of plantations for U. S. Rubber and now a vice-president of the Rubber Reserve Co., and Dr. Earl N. Bressman, director of the agricultural division of the Office of Inter-American Affairs, it now seems definite that within the next two or three years we will be able to count on Latin America for 80,000 to 90,000 tons of crude rubber annually. Rubber Reserve, according to Mr. Bicknell, looks for 10,000 to 13,000 tons this year, and 30,000 to 40,000 tons next year.

The British, too, are making every effort to secure crude rubber from sources which hitherto produced but scant supplies. It is understood that an agreement has been reached between the British and Belgian Colonial governments under which Britain will purchase all of the rubber produced in the Belgian Congo.

In the meantime, investigations to determine the rubber-bearing possibilities of domestic plants continue. The latest rubber company to lend its aid to this program is Firestone which has announced that it would continue the work started by the late Thomas A. Edison. Similar investigations are already under way at Goodyear, Goodrich and U. S. Rubber, Goodrich cooperating with Cornell University. Prices shown below are those set by the Rubber Reserve Company:

As of August 12

Fixed Government Prices

Plantations—			
Ribbed Smoked Sheets—			
No. 1 Spot	—	@	.22½
No. 2	—	@	.22¼
No. 3	—	@	.22
No. 4	—	@	.21¾
Thin Latex Crepe	—	@	.23⅛
Thick Latex Crepe	—	@	.23⅛
Brown Crepe, No. 1	—	@	.21⅜
Brown Crepe, No. 2	—	@	.21⅛
Amber Crepe, No. 2	—	@	.21⅜
Amber Crepe, No. 3	—	@	.21⅛
Brown Crepe, Rolled	—	@	.17⅛
Latex—			
Normal, carload lots, tanks	—	@	.2595
Normal, carload lots, drums	—	@	.2825
Conc., carload lots, tanks	—	@	.2765
Conc., carload lots, drums	—	@	.2950
Guayule—			
Ampar	—	@	.28
Paras—			
Up-River, fine	—	@	—
Acre Bolivian, fine	—	@	—
Balata**—			
Surinam Sheet	—	@	.55
Prime Manaos Block	—	@	.50
Peruvian Prime	—	@	.50
Venezuelan Block	—	@	.52

* Prices for import.

Scrap Rubber

The higher prices now allowed for scrap rubber have resulted in definitely better movement of supplies from all parts of the country. Under the terms of the latest OPA orders covering the sale of scrap, shippers are now assured of remunerative sales. Latest available figures published by the Petroleum Industry War Council on the nation-wide scrap rubber collection campaign amounted to 454,155 tons. This covered only scrap delivered to oil bulk depots and weighed so that additional amounts are yet to be added before final figures can be publicized. Prices shown below are ceilings on typical classifications:

(Prices to Consumers, Delivered Akron)

Mixed passenger tires	ton	$18.00
Beadless passenger tires	ton	24.00
Mixed truck tires	ton	18.00
Beadless truck tires	ton	24.00
No. 1 passenger peelings	ton	47.50
No. 1 truck peelings	ton	47.50
Gray carcass	ton	47.50
No. 2 passenger tubes	lb.	.07¾
Red passenger tubes	lb.	.07½
Black passenger tubes	lb.	.06¾
Mixed passenger tubes	lb.	.06¾
No. 2 truck tubes	lb.	.07½
Red truck tubes	lb.	.07¼
Black truck tubes	lb.	.05¼
Buffings	ton	35.00
Bicycle tires	ton	15.00
Air bags and water bags	ton	15.00
Boots and shoes	ton	33.00
Black mechanical scrap, above 1.10	ton	20.00

Tire Fabrics

The situation in the tire fabric field remains unchanged, with practically no demand for such fabrics. Consequently, prices are nominal and in many quarters are not even being quoted. The prices shown below are those which were in force on or about January 15.

(Prices Net at the Mill)

Peeler, carded, 23/5/3	lb.	.43½ @ .44
Peeler, carded, 23/4/3	lb.	.44½ @ .45
Peeler, carded, 15/3/3	lb.	.41½ @ .42
Peeler, carded, 15/4/2	lb.	.41½ @ .42
Peeler, carded, 13/3/3	lb.	.40½ @ .41
CHAFERS		
Carded, American, 1 1/16"	lb.	.43½ @ .44
Carded, American, 1"	lb.	.39½ @ .48

Sheetings

48x40	36 in.	5.50	lb.	—	@ 7.818
40x40	36 in.	6.15	lb.	—	@ 6.991
40x36	36 in.	6.50	lb.	—	@ 6.615
48x48	40 in.	2.50	lb.	—	@16.200
48x48	40 in.	2.85	lb.	—	@14.210
56x60	40 in.	3.60	lb.	—	@11.944
48x44	40 in.	3.75	lb.	—	@11.066

Note: Prices shown above are ceiling prices set by order of the O.P.A. Quotations are based on an average price of 15-16-inch middling cotton of 20.37c at the ten designated southern markets.

Cotton

Cotton prices have declined sharply in the past thirty days, the price of 20.71 on July 13, high for the period, dropping to 19.12 on August 10, low for the period. Continued nervousness in the market was primarily responsible for the gradual decline, occasioned by uncertainty of government actions, particularly over consideration of the loan bill. The belief that a deal had been arranged to allow passage of full parity crop loans strengthened the market somewhat in mid-July, but the news that the parity bill would be delayed indefinitely and possibly shelved (which is what eventually happened) broke the market firmness and prices started sliding again. The prediction by the Crop Reporting Board of the Department of Agriculture of a cotton crop of 13,085,000 bales, announced on August 8, was sufficient to cause a drop from 19.59 to 19.21 in the price. It dropped still lower, to 19.12, low for the period, the following trading day. Prices are expected to follow an irregular pattern for the next few weeks. Quotations for middling uplands on the Exchange follow:

	July 11	August 12		
	Close	High	Low	Close
October	19.44	17.89	17.80	17.89
December	19.51	18.07	17.98	18.06
March	....	18.23	18.14	18.23

Reclaimed Rubber

Demand for reclaimed rubber has eased somewhat in the past several weeks due to two factors—the usual summer seasonal drop and the latest restrictions placed on the use of the material. There is no question but that increased demand will be evident within the next few months. According to the latest figures from the industry, the amount of scrap collected in the recent nation-wide collection campaign, which far exceeded estimates made privately by various reclaimers, assures the industry of sufficient supplies for the next two years or so. The reclaimers had about a five months' supply on hand prior to the campaign which brought in almost 500,000 tons. According to the Conservation Division of WPB, the ratio of reclaimed rubber to crude rubber consumption in 1941 was 21%. Prices shown below are ceilings on typical grades:

Shoe				
Unwashed	lb.	.07	@	.07¼
Tube				
Black Tube	lb.	.11¼	@	.11½
Red Tube	lb	.12	@	.12¼
Tires				
Black (acid process)	lb.	.07½	@	.07¾
Black, selected tires	lb.	.06½	@	.06¾
Truck, Heavy Gravity	lb.	.08½	@	.08¾
Miscellaneous				
Mechanical blends	lb.	.04½	@	.05½
White	lb.	.13	@	.13¼

Ducks

Enameling (single filling)	lb.	—	@ .43¼
Belting and Hose	lb.	—	@ .39
Single filling, A grade	lb.	—	@ .19¾
Double filling, A grade	lb.	—	@ .20¾

CHEMICAL MARKETS

New York, Aug. 12, 1942
All Prices F.O.B. Works

ACCELERATORS

Organic

A-1 (Thiocarbanilid)	lb.	.28 @	.33
A-10	lb.	.36 @	.42
A-11	lb.	.52 @	.65
A-19	lb.	.52 @	.65
A-32	lb.	.60 @	.70
A-77	lb.	.42 @	.55
A-100	lb.	.42 @	.55
Aldehyde ammonia, crystals	lb.	.65 @	.70
Altax	lb.	.43 @	.45
Beutene	lb.	.59 @	.64
B-J-F	lb.	.38 @	.43
Butyl Zimate	lb.	— @	1.13
Captax	lb.	.38 @	.40
Crylene	lb.	.40 @	.47
Di-Ortho-Tolyguanidine	lb.	.44 @	.46
Diphenylguanidine	lb.	.35 @	.45
El-Sixty	lb.	.40 @	.47
Ethyl Zimate	lb.	— @	1.13
Ethylidene aniline	lb.	.42 @	.43
Formaldehyde aniline	lb.	.31 @	—
Guantal	lb.	.49 @	.50
Hepteen	lb.	.34 @	.39
Hexamethylenetetramine	lb.	.33 @	—
Lead Oleate, No. 999	lb.	.13 @	—
Witco	lb.	.15 @	—
Ledate	lb.	— @	1.48
Methyl Tuads	lb.	— @	1.53
Methyl Zimate	lb.	— @	1.23
Monex	lb.	— @	1.53
Pentex	lb.	.74 @	.84
Phenex	lb.	.50 @	.55
Pip-Pip	lb.	— @	1.65
R & H 50-D	lb.	.42 @	.43
R-2	lb.	1.40 @	1.80
R-2 Crystals	lb.	1.55 @	1.70
Rotax	lb.	.48 @	.50
Safex	lb.	1.15 @	1.25
Selenac	lb.	— @	1.98
SPDX	lb.	.70 @	.75
Super-Sulfur No. 2	lb.	.13 @	.15
Thiocarbanilid, drums	lb.	.28 @	.33
Thiurad	lb.	— @	1.55
Trimene	lb.	.54 @	.64
base	lb.	1.03 @	1.18
Triphenylguanidine	lb.	.45 @	—
Ulto	lb.	1.25 @	1.75
Ureka	lb.	.50 @	.57
Blend B	lb.	.50 @	.57
Blend C	lb.	.48 @	.55
Vulcanex	lb.	.42 @	.43
Vulcanol	lb.	.85 @	—

Inorganic

Litharge, domestic	lb.	.07 @	.07½
Magnesia, calcined, heavy	lb.	.04 @	—

COLORS

Blacks (See Next Column)

Blues [b]

Prussian	lb.	.36 @	—
Ultramarine	lb.	.16 @	.27

Browns [b]

Mapico	lb.	.11 @	—
Umber, Turkey	lb.	.04¼ @	.05⅞

Greens [b]

Chrome	lb.	— @	.25
Guignet's Green	lb.	.70 @	—

Reds

Antimony crimson, 15/17	lb.	— @	—
sulfur, free	lb.	— @	—
Indian	lb.	.08¾ @	—
Domestic (Maroon)	lb.	.11 @	—
Mapico	lb.	.09¾ @	—
Red oxide, pure	lb.	.10 @	.12
Rub-Er-Red	lb.	.09¼ @	—

Whites [b]

Cryptone No. 19	lb.	.0560 @	.0585
Cryptone CB No. 21	lb.	.0560 @	.0585
Cryptone ZS-800	lb.	.0825 @	.0850
Lithopone:			
Albalith	lb.	.04¼ @	.04½
Astrolith	lb.	.04¼ @	.04½
Azolith	lb.	.04¼ @	.04½
Ray-cal	lb.	.05½ @	.05¾
Rayox	lb.	.14½ @	.15¼
Titanox A	lb.	.14½ @	.14¾
Titanox B	lb.	.05¾ @	.06
Titanox C	lb.	.05½ @	.05¾

Zinc Oxide—American Process [b]

American Azo:			
ZZZ (lead free)	lb.	.07¼ @	.07½
Anaconda, lead free	lb.	.07¼ @	.07½
Horsehead Lead Free Brand:			
Special—3	lb.	.07¼ @	.07½
XX Red—4	lb.	.07¼ @	.07½
XX Red—72	lb.	.07¼ @	.07½
XX Red—103	lb.	.07¼ @	.07½
Kadox, black label—15	lb.	.07¼ @	.07½
Red label—17	lb.	.07¼ @	.07½
St. Joe, black label	lb.	.07¼ @	.07½
green label	lb.	.07¼ @	.07½
red label	lb.	.07¼ @	.07½
U. S. P.—7, bbls.	lb.	.10½ @	.10¾

[a] Price Ceilings.
[b] Price Suggestions or Agreements.

Zinc Oxide—French Process: [b]

Florence White Seal—7 bbl.	lb.	.09½ @	.09¾
Green seal—8	lb.	.09 @	.09¼
Red seal—9	lb.	.08½ @	.08¾

Yellows [b]

Cadmolith	lb.	.55 @	.60
Chrome	lb.	— @	.50
Mapico	lb.	.07¼ @	—

BLACKS
(In bags, carload lots)

Aerfloted Arrow	.0355 @	—
Certified	.0355 @	—
Certified Spheron	.0355 @	—
Channel "S"	.12 @	—
Continental	.0355 @	—
Disperso	.0355 @	—
Dixiedensed	.0355 @	—
Dixiedensed 66	.0355 @	—
Excello	.0355 @	—
Furnex	.03½ @	.06
Furnex Beads	.03½ @	.06
Gastex	.03½ @	.06
Kosmobile	.0355 @	—
Kosmobile 66	.0355 @	—
Kosmos-Dixie 20	.03½ @	.06
Micronex (Amarillo)	.0355 @	—
Micronex Beads (Amarillo)	.0355 @	—
Pelletex	.03½ @	.06
P-33	.0475 @	—
Shell Carbon (Del. Midwest)	.025 @	—
Supreme	.0355 @	—
Thermax	.0225 @	—
Thermax "S"	.0675 @	—
Wyex	.0355 @	—

COMPOUNDING MATERIALS

Aluminum Flake	ton	18.00	@24.50
99½%-300	ton	—	@16.50
86-90%-300	ton	—	@13.50
Asbestine	ton	16.50	@20.00
Barium carbonate (98-100%)	ton	47.00	@49.00
Barytes	ton	25.35	@36.00
Bentonite	ton	11.00	@16.00
Blanc fixe, dry	ton	60.00	@67.50
Calcene	ton	37.50	@43.00
Catalpo (fact.)	lb.	.02 @	—
Chalk, precipitated			
Suprex white	ton	32.50	@45.00
Clay, Aerfloted, Suprex	ton	11.00	@23.50
Aerfloted Paragon	ton	10.00	@22.50
Crown (f.o.b. plant)	ton	11.00	@ —
Dixie	ton	—	@11.00
Langford	ton	—	@ 8.50
McNamee	ton	—	@10.00
Par	ton	—	@11.00
Witco	ton	10.00	@ —
Cotton Flock (Dark)	lb.	.10½ @	.13
Kalite No. 1	ton	—	@26.00
Kalite No. 3	ton	—	@36.00
Kalvan	ton	—	@100.00
Kalvan "S"	lb.	—	@ .09½
Magnesium carbonate	lb.	.06¼ @	—
Mica	ton	35.00	@44.00
Mineralite	ton	—	@30.00
Pyrax A	ton	—	@ 7.50
Rottenstone (powd. Dom.)	ton	25.50	@37.50
Rubberol	lb.	—	@ .17½
Silene (calcium silicate)	lb.	.04 @	.045
Starch, powdered	cwt.	2.90 @	4.10
Talc, domestic	ton	17.00	@25.00
Whiting, commercial	ton	16.00	@26.00
Columbia Filler	ton	9.00	@14.00
Witco	ton	6.00 @	—
Wood Flour (100 mesh)	ton	30.00	@32.00

MINERAL RUBBER

285°-300° Mineral Rubber	ton	25.00 @	—
Black Diamond	ton	25.00 @	—
Genasco, solid (factory)	ton	— @	—
Hard Hydrocarbon	ton	25.00	@27.00
MilliMar	lb.	— @	.05½
Parmr, solid	ton	— @	—
Pioneer, MR. solid	ton	— @	—

MISCELLANEOUS

Aromatics—Rodo #0	lb.	4.00 @	4.50
Rodo #10	lb.	5.00 @	5.50
Curodex 19	lb.	2.75 @	—
Curodex 188	lb.	3.50 @	—
Curodex 198	lb.	4.50 @	—
Para-Dors	lb.	4.50 @	—
Aresklene No. 375	lb.	.35 @	.50
Darvan (dispersing agent)	lb.	.30 @	.34
Santomerse S	lb.	.11 @	.25
Sponge Paste	lb.	— @	.18
Sunproof	lb.	.22¾ @	.27¾
Tackol (tackifier)	lb.	.085 @	.18
Tonox	lb.	.50 @	.59
Ty-Ply	gal.	6.75 @	8.00
Unicel (blowing agent)	lb.	.50 @	—

SOFTENERS

Acids

Acetic, 28%, bbls. [a]	100 lb.	3.38 @	3.63
Nitric, 36 degrees	cwt.	5.00 @	—

Acids, Fatty

Laurex	lb.	.14¾ @	.17¾
SL #10	lb.	.12 @	.14
Stearex Beads	lb.	.10 @	.11
Stearite	lb.	.10 @	—

Alkalies

Caustic Soda, 76%	cwt.	2.70 @	5.70
Soda Ash, 58%	cwt.	1.15 @	2.98

Oils

Cycline Oil	gal.	.14 @	.20
Degras, bbls.	lb.	.12 @	.12½
Para-Flux	gal.	.17 @	.18
Para-Lube	lb.	.046 @	.048
Petrolatum, amber [b]	lb.	.03½ @	.04½
Pigmentaroil, tank cars	gal.	.20½ @	—
in drums	gal.	.29 @	.30
Pine, steam distilled	gal.	1.20 @	—
Rosin Oil, cmpd.	gal.	.40 @	—
Rubberol	lb.	.13½ @	.14
Rubtack	lb.	.10 @	—
Seedine, c.l.	lb.	.07¼ @	—
Tackol	lb.	.08½ @	.18
Witco Palm Oil	lb.	— @	—
Witco Softener No. 20	gal.	.20 @	—
Woburn No. 8, c.l.	lb.	.06 @	—

Resins and Pitches

Pitch, Burgundy	lb.	.06 @	.06½
coal tar	ton	19.00	@22.00
hardwood	ton	16.00	@22.50
pine, 200 lb. gr. wt.	bbl.	6.00 @	6.50
Pigmentar, tank cars	gal.	.20½ @	—
in drums	gal.	.29 @	.30
Retort Pine Tar, drums	gal.	.29 @	.30

Solvents

Acetone, pure [a]	lb.	.07 @	.173
Benzene, 90%, tank car	gal.	.14 @	—
Beta-Trichlorethane	gal.	— @	.20
Bondogen	lb.	.98 @	1.05
Carbon, bisulfide	lb.	.05 @	.08½
Carbon tetrachloride	gal.	.73 @	1.27
Dichlorethylene	lb.	— @	—
Dipentene, cml., drums	gal.	.48 @	.50
Ethylene dichloride	lb.	.07½ @	.08½
Plastogen	lb.	.07¾ @	.08
Reogen (drums)	lb.	.11½ @	.12
Rub-Sol	gal.	.09½ @	—
Trichlorethylene	lb.	.08 @	.09½
Turpentine, spirits	gal.	.82 @	.86
dest. dist., drums	gal.	.60 @	.65

Waxes

Beeswax, white [b]	lb.	.61 @	—
Carnauba, yellow [b]	lb.	.86 @	.88
Ceresin, white, dom.	lb.	.13½ @	.15
Montan, crude	lb.	.45 @	.46
Paraffin [a]			
Yellow crude scale, 124/126	lb.	.04¼ @	—
Refined, 123/125	lb.	.05¼ @	—

ANTI-OXIDANTS

Agerite Alba	lb.	1.95 @	2.05
Gel	lb.	.56 @	.58
Hipar	lb.	.64 @	.66
Powder	lb.	.48 @	.50
Resin	lb.	.48 @	.50
Resin D	lb.	.48 @	.50
White	lb.	1.23 @	1.33
Albasan	lb.	.69 @	.74
Antox	lb.	— @	.56
B-L-E	lb.	.48 @	.57
Flectol H	lb.	.52 @	.65
Flectol White	lb.	.90 @	1.15
Neozone A, B, C, D, E	lb.	.52 @	.63
Oxynone	lb.	.77 @	.90
Retardex	lb.	.45 @	.48
Santoflex B	lb.	.52 @	.65
Santovar A	lb.	1.15 @	1.40
S.C.R.	lb.	.33 @	.35
Stabilite	lb.	.52 @	.54
Stabilite Alba	lb.	.70 @	.75
VGB	lb.	.48 @	.57

EXTENDERS

Naftolen	lb.	.15 @	.25
Vanzak	gal.	.05 @	.06

LUBRICANTS—MOLD & RUBBER SURFACE

Aresklene	lb.	.35 @	.50
Cocoa Soapstock	lb.	.06 @	.08
Colite	gal.	.90 @	1.15
Dipex	lb.	.06 @	.08
Glycerized Liquid Lubricant	gal.	— @	1.35
Lubrex	lb.	.25 @	.30
Mineralite	ton	— @	30.00
Mold Paste	lb.	.12 @	.18
Sericite	ton	65.00 @	75.00
Soap Tree Bark, cut, sifted	lb.	.06 @	.08

FACTICE OR RUBBER SUBSTITUTES

Amberex	lb.	.25 @	—
Amberex Type B	lb.	.18¾ @	—
Black	lb.	.08½ @	.13
White	lb.	.09 @	.15
Brown	lb.	.10 @	.14
Neophax A	lb.	.16½ @	—

VULCANIZING INGREDIENTS

Dispersed Sulfur No. 2	lb.	.08 @	.12
Sulfur Chloride, yellow (drs.)	lb.	.03 @	.08
Sulfur, rubber makers			
Refined (bags)	cwt.	2.40 @	—
Commercial (bags)	cwt.	2.05 @	—
Telloy	lb.	1.75 @	—
Vandex	lb.	1.75 @	—

STATISTICS

SPECIAL NOTE: Much of the statistics carried in this section is of military value and accordingly have been discontinued for the duration of the war. See explanatory footnotes under each table.

U. S. Imports and Exports of Crude Rubber

YEARS	Gross Imports: Long Tons	Gross Imports: Total Declared Value	Gross Imports: Average Declared Value per pound Cents	Re-exports: Long Tons	Re-exports: Total Declared Value	Re-exports: Average Declared Value per pound Cents	Net Imports: Long Tons
1924	325,899	173,367,272	23.75	10,309	6,057,637	26.23	315,590
1925	393,370	426,167,504	48.36	14,827	19,847,753	59.76	378,543
1926	409,944	501,131,064	54.57	17,671	22,470,583	56.77	392,273
1927	424,733	338,688,492	35.60	27,775	24,735,488	39.76	396,958
1928	432,633	242,727,423	25.05	32,159	18,128,761	25.17	400,474
1929	560,082	239,177,811	19.06	36,485	16,868,718	20.64	523,597
1930	482,083	139,133,048	12.88	30,205	9,310,205	13.76	451,878
1931	497,176	72,922,845	6.55	25,595	4,255,572	7.42	471,581
1932	409,556	31,936,459	3.48	20,930	2,015,612	4.30	388,626
1933	407,817	44,034,064	4.82	20,537	2,601,352	5.65	387,280
1934	449,513	97,929,676	9.73	23,848	5,770,109	10.80	425,665
1935	453,134	115,299,448	11.36	11,389	3,084,331	12.09	441,745
1936	467,064	152,072,496	14.54	12,581	4,488,223	15.93	454,483
1937	574,600	237,307,041	18.44	7,902	3,385,433	19.02	566,698
1938	397,620	125,357,730	14.07	5,652	1,799,124	14.21	391,968
1939	469,803	167,558,245	15.92	13,125	5,832,618	19.84	456,678
1940	780,820	303,117,726	17.33	7,060	3,197,136	20.22	773,760
1941*	739,678	301,224,726	18.18	4,177	2,116,945	22.63	735,501
1940:							
Sept.	75,770	29,317,540	17.27	666	349,443	23.43	75,104
Oct.	73,179	27,975,598	17.07	316	123,216	17.38	72,863
Nov.	69,844	26,917,136	17.21	126	52,020	18.45	69,718
Dec.	94,172	36,369,973	17.24	205	94,422	20.52	93,967
1941:							
Jan.	84,201	33,370,482	17.69	292	138,009	21.11	83,909
Feb.	70,745	28,469,753	17.97	327	144,139	19.69	70,418
Mar.	84,991	34,030,846	17.88	329	163,375	22.19	84,662
Apr.	61,288	24,193,639	17.62	238	99,371	18.96	61,054
May	98,438	39,537,574	17.93	370	204,865	24.72	98,068
June	62,124	25,179,498	18.09	476	257,254	24.13	61,648
July	94,622	39,296,581	18.54	423	219,597	23.17	94,199
Aug.	104,057	44,101,058	18.92	973	488,299	22.40	103,084
Sept.	79,212	33,045,295	18.62	749	402,036	23.96	78,463

Note: Statistics supplied by the Department of Commerce. Publication of figures discontinued with those of September, 1941, for the duration of the war. Gross Imports shown do not include latex or guayule. (*) First 9 months only.

United States Imports of Guayule, Balata, Jelutong, Liquid Latex

(All Quantities in Long Tons)

	Guayule: Tons	Guayule: Dollars	Balata: Tons	Balata: Dollars	Jelutong: Tons	Jelutong: Dollars	Liquid Latex: Tons	Liquid Latex: Dollars
1924	1,356	536,392	464	568,456	6,165	1,237,100	2,157	864,059
1925	3,781	1,803,448	517	574,750	6,749	1,642,531	3,272	3,537,510
1926	4,305	2,562,096	354	327,213	7,263	3,127,757	3,394	4,686,743
1927	5,018	2,674,957	582	477,246	7,785	2,448,657	1,495	1,170,650
1928	3,077	1,755,685	731	430,855	7,552	2,540,059	4,007	2,121,786
1929	1,275	545,175	728	566,964	8,204	2,458,126	3,729	1,788,391
1930	1,096	347,388	502	422,684	5,907	1,403,244	4,458	1,508,786
1931	....	.....	1,207	411,380	5,777	1,019,010	4,675	888,909
1932	....	.....	707	147,403	4,607	616,596	5,112	601,999
1933	...	.....	1,659	2,261,869	3,990	944,895	11,085	1,833,671
1934	398	75,349	1,054	438,209	4,987	943,752	13,107	3,643,221
1935	459	86,835	615	188,384	5,644	1,063,126	13,553	3,782,222
1936	1,229	286,552	535	199,368	6,163	1,296,364	19,852	6,659,899
1937	2,694	745,873	354	151,344	7,109	2,017,786	23,185	10,213,670
1938	2,485	623,819	509	181,140	9,132	2,944,504	11,878	4,147,318
1939	2,232	463,345	694	265,553	6,640	1,603,418	27,438	10,467,552
1940	3,634	758,007	648	300,500	7,451	2,449,137	33,789	14,593,466
1941*	3,536	812,966	581	257,326	5,495	1,789,227	20,775	9,280,551
1940:								
Sept.	250	49,845	40	19,245	712	246,641	2,953	1,337,487
Oct.	381	77,286	70	38,092	1,150	382,168	1,156	512,153
Nov.	392	78,587	67	43,939	443	152,297	2,308	1,169,086
Dec.	278	62,586	54	39,471	1,102	341,876	3,534	1,539,957
1941:								
Jan.	447	104,128	57	32,910	698	221,911	2,184	1,019,741
Feb.	283	65,942	41	22,790	768	245,732	2,946	1,279,648
Mar.	426	98,187	36	16,147	715	258,514	1,707	774,225
Apr.	423	95,916	64	18,533	514	189,520	1,594	648,217
May	334	76,414	61	44,381	822	287,249	2,632	1,117,226
June	383	86,949	67	30,470	552	179,779	2,070	936,944
July	411	94,874	100	34,119	830	215,176	2,049	930,126
Aug.	499	111,502	41	19,344	159	50,934	1,984	779,079
Sept.	330	79,054	114	38,632	437	140,412	3,609	1,795,345

Note: Statistics supplied by the Department of Commerce. Publication of figures discontinued with those of September, 1941, for the duration of the war. Figures shown for latex are dry rubber content. (*) First 9 months only.

U. S. Consumption of Crude Rubber

(Including Latex)

	1934	1935	1936	1937	1938	1939	1940	1941
Figures on Monthly Basis								
Jan.	39,190	46,636	48,631	50,879	31,265	47,387	58,061	65,989
Feb.	40,515	42,720	36,841	51,950	25,357	43,422	52,078	62,692
Mar.	47,003	42,153	42,813	54,129	32,389	51,416	52,454	69,024
Apr.	44,853	44,247	52,031	51,859	29,730	45,268	52,361	71,374
May	42,918	41,101	50,612	51,795	30,753	45,484	54,513	71,365
June	40,147	36,156	52,772	51,860	32,540	48,438	47,834	84,912
July	32,553	35,917	48,250	43,703	34,219	44,975	48,354	68,653
Aug.	33,216	38,775	46,777	41,506	40,552	51,740	53,307	55,365
Sept.	30,258	37,086	46,449	43,945	40,183	51,402	52,469	53,655
Oct.	31,253	41,969	49,637	38,754	42,850	57,155	59,644	60,418
Nov.	34,748	42,310	50,433	34,025	49,050	55,677	57,716	N.A.
Dec.	36,569	42,474	49,754	29,195	48,143	49,636	59,709	N.A.
Tot.	453,223	491,544	575,000	543,600	437,031	592,000	648,500	663,447*

Note: Figures for 1934 to 1940, inclusive, are based on the annual surveys conducted by the former Leather & Rubber Division of the Bureau of Foreign & Domestic Commerce; figures for 1941 are estimates of the Rubber Manufacturers Association. Publication of figures was discontinued with those of October, 1941, for the duration of the war. (N.A.) Not Available. (*) First 10 months only.

Reclaimed Rubber in the United States

(All Quantities in Long Tons)

Year	Production	Consumption: Tons	Consumption: % to Crude	Stocks	Year	Production	Consumption: Tons	Consumption: % to Crude	Stocks
1932	75,656	77,500	23.3	16,334	1937	185,033	162,000	29.8	28,800
1933	93,587	85,000	21.2	17,780	1938	122,400	120,800	29.9	23,000
1934	108,162	100,855	22.3	20,000	1939	186,000	170,000	28.7	25,250
1935	122,948	117,523	23.9	17,000	1940	208,971	190,244	29.3	32,636
1936	150,571	141,486	24.6	19,000	1941*	228,524	212,940	32.1	38,604†
Figures on Monthly Basis									
1940:									
Jan.	19,239	16,341	28.1	27,089	July	14,299	14,539	30.1	27,129
Feb.	17,938	15,629	30.0	27,962	Aug.	17,161	14,464	27.1	28,526
Mar.	17,182	16,200	30.9	27,524	Sept.	16,379	14,835	28.3	29,039
Apr.	16,518	16,573	31.7	26,492	Oct.	19,300	16,807	28.2	30,816
May	17,499	15,984	29.3	27,141	Nov.	17,636	16,312	28.3	31,459
June	16,581	15,163	31.7	27,701	Dec.	19,239	17,397	29.1	32,636
1941:									
Jan.	20,413	19,086	28.9	33,380	July	23,111	21,725	31.6	36,751
Feb.	19,506	18,222	29.1	33,654	Aug.	24,111	20,864	38.7	39,099
Mar.	22,006	19,611	28.4	35,028	Sept.	24,678	24,032	44.8	38,055
Apr.	21,574	20,427	28.6	35,336	Oct.	26,560	25,009	41.4	38,604
May	22,775	21,405	30.0	35,871	Nov.	N.A.	N.A.	...	N.A.
June	23,790	22,559	26.6	36,265	Dec.	N.A.	N.A.	...	N.A.

Note: Figures for 1932 to 1940, inclusive, are based on the annual surveys conducted by the former Leather & Rubber Division of the Bureau of Foreign & Domestic Commerce; figures for 1941 are estimates of the Rubber Manufacturers Association. Publication of figures was discontinued with those of October, 1941, for the duration of the war. (N.A.) Not Available. (*) First 10 monthly only. (†) As of October 31, 1941.

U. S. Consumption of Gasoline

(In Thousands of Barrels of 42 Gallons)

	1939	1940	1941		1939	1940	1941
January	38,089	40,370	45,344	August	54,025	55,346	62,944
February	34,928	37,557	42,001	September	49,505	52,297	58,995
March	43,042	44,607	48,760	October	49,854	53,807	N.A.
April	44,264	47,683	55,154	November	47,407	49,074	N.A.
May	49,766	52,946	59,307	December	43,807	46,413	N.A.
June	50,133	55,459	58,360				
July	50,689	53,865	63,093	Total	555,509	589,424	493,958*

Note: Statistics supplied by the Bureau of Mines. Publication of figures was discontinued with those of September 1941, for the duration of the war. (*) First 9 months only. (N.A.) Not Available.

Rims Inspected and Passed in U. S.

(Tire and Rim Association Reports)

	Total		Total		Total
1930	17,364,096	1934	12,255,118	1938	10,619,338
1931	11,253,800	1935	18,664,107	1939	17,471,914
1932	6,261,336	1936	20,789,504	1940	19,378,558
1933	8,713,962	1937	22,257,798	1941	25,193,698
1942		1942		1942	
January ...	1,270,636	May	617,054	September .	.....
February ..	823,357	June	554,786	October ...	.....
March	668,536	July	573,420	November .	.....
April	664,875	August	.....	December ..	.....

Daily Spot Closing Prices of Ribbed Smoked Sheet Rubber—New York Market, in Cents per Pound

Daily Spot Closing Prices of Ribbed Smoked Sheet Rubber—*New York Market, in Cents per Pound*

1939	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Ave
December	20	20	—	19¾	19⅞	19⅝	—	19⅝	19⅝	—	20⅞	20⅞	20½	20⅝	20⅝	20⅝	—	20½	20⅝	20⅝	20⅝	20⅝	—	—	—	—	20⅛	19⅝	19⅝	19⅝	—	—	20
1940																																
January	19⅛	19⅛	19⅛	19⅛	19⅛	19⅞	—	19⅛	19¼	19¼	19½	19⅝	19⅝	—	19⅝	19⅞	19⅛	19⅛	19⅛	19⅛	18⅞	18⅞	19⅞	18⅞	18⅛	18⅛	18⅝	18⅝	18¾	18⅛	18⅛	19
February	18¾	18¾	18¾	18¾	18¾	18¾	—	18¾	19⅛	19⅛	18¾	18¾	18⅝	18½	19⅛	18⅞	19⅛	19⅛	19⅛	18¾	18¾	19⅛	18⅛	18⅛	18⅛	18⅝	18¾	18¾	18¾	18⅛	18⅛	18¾
March	18⅞	18⅞	18½	18½	18⅝	18⅝	18⅛	18⅛	18⅛	18⅞	18⅛	18⅛	18⅛	19⅛	18½	20	19⅞	18⅝	18½	20	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝
April	18⅝	18⅝	18½	18⅝	18⅛	18⅛	19	19	18⅛	18⅝	18⅛	18⅛	18⅛	18⅛	18⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛	19⅛
May	19¼	19¼	20	20⅛	21⅛	20	20	20⅛	20	24	23½	23⅛	23⅛	24	23½	23⅛	22½	22⅝	22⅝	22⅝	21	21	20½	20	20	20⅛	20⅛	20⅛	20⅛	21	21	21⅛
June	22	22	21½	21½	20½	21⅛	21⅛	20⅛	20⅛	20½	20⅛	20⅛	22¼	22½	22¼	21	22¼	22¼	22¼	22¼	23	22¼	22⅛	22⅛	21⅞	21⅞	22	21⅛	21⅛	21⅛	20	21⅛
July	21⅝	21⅝	20½	21½	21⅛	21⅛	21⅛	21⅛	20⅛	20⅛	20⅛	20⅛	21	21	21	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	20⅛	19⅝	19⅝
August	19⅝	19⅝	—	—	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝
September	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝
October	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝	19⅝
November	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝
December	20¾	20¾	20⅞	20⅞	21	20⅞	21	—	21	21	21	21	21	21	21	20¾	20¾	20¾	20¾	20¾	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	20⅝	21
1941																																
January	20⅛	—	20½	20½	—	20½	20⅜	20⅜	20¼	20⅛	20⅛	—	20⅛	20⅛	20	19⅞	19⅝	19⅝	19⅝	19⅝	19⅝	19¼	19⅛	19⅛	19⅛	19⅛	19⅛	19⅝	19⅝	19⅝	19⅝	19⅝
February	—	—	19⅞	19⅞	19⅞	19⅞	19⅞	19⅞	—	20⅛	20⅛	22	20⅝	20⅝	20½	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛	20⅛
March	20⅞	20⅞	21⅛	21⅛	21⅞	21⅞	21½	21½	—	22½	22	22⅞	22⅛	23	23⅛	22⅝	22⅝	22⅝	22⅝	22⅝	22⅝	22⅝	22⅝	22⅝	22⅝	22⅝	22⅝	22⅝	22⅝	22⅝	22⅝	22⅝
April	22⅞	22⅞	22⅝	22⅝	22⅝	22⅝	24	24	22½	24	24	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24	23⅞	23⅞	24	24	24	24	24	24	24	24	24
May	24	24	23⅝	23⅝	23⅝	23⅝	24	24	24	24	24	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24⅛	24	24	24	24	24	24	24	24	24	24	24	24	24
June	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝
July	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝
August	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝
September	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝
October	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝
November	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝
December	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝	23⅝
1942																																
January	—	—	—	—	24½	24⅜	24⅜	24⅜	24⅛	—	—	—	24⅜	24⅛	24⅛	24⅛	—	—	—	24⅛	23⅞	24	24	24	—	—	23¾	23	23½	23½	23¾	—	24

Note: In view of government regulations concerning the purchase of crude rubber trading in so-called "free" rubber practically stopped by the end of January, 1942, which accounts for the lack of quotations after January 31, 1942.

Average Spot Closing Prices—
Ribbed Smoked Sheets

(New York Markets)

Average Price per Pound for Years 1913-1932

Year	Cents	Year	Cents	Year	Cents	Year	Cents	Year	Cents
1914	65.13	1918	60.15	1922	17.50	1926	48.50	1930	11.98
1915	65.85	1919	48.79	1923	29.45	1927	37.72	1931	6.17
1916	72.50	1920	36.30	1924	26.20	1928	22.48	1932	3.49
1917	72.23	1921	16.36	1925	72.46	1929	20.59	1933	5.96

Average Monthly Price per Pound Since 1933

	1934 Cents	1935 Cents	1936 Cents	1937 Cents	1938 Cents	1939 Cents	1940 Cents	1941 Cents
Jan.	9.32	13.10	14.35	21.37	14.63	15.75	19.06	19.88
Feb.	10.45	12.92	15.48	21.33	14.71	15.93	18.83	20.43
Mar.	11.01	11.51	15.89	24.09	13.55	16.26	18.58	22.17
Apr.	12.10	11.55	15.98	23.44	11.84	15.87	19.16	22.74
May	13.26	12.05	15.62	21.14	11.57	16.07	21.21	23.90
June	13.51	12.57	15.85	19.29	12.57	16.37	22.20	21.88
July	14.60	12.10	16.49	18.86	15.37	16.51	21.12	22.19
Aug.	15.47	11.98	16.25	18.37	16.08	16.67	19.62	22.70
Sept.	15.36	11.55	16.46	18.53	16.15	21.24	19.28	22.57
Oct.	13.96	12.62	16.55	16.28	16.89	19.89	20.33	23.10
Nov.	13.04	13.15	17.97	14.60	16.24	20.21	21.04	23.14
Dec.	12.98	13.28	20.01	15.41	16.05	20.01	20.76	24.04
Average for Year	12.92	12.37	16.41	19.39	14.64	17.57	20.10	22.40

London Closing Prices of Ribbed Smoked Sheets

(In Pence Per Pound)

Day	1941 May	1941 June	1941 July	1941 Aug.	Day	1941 May	1941 June	1941 July	1941 Aug.
1	14	—	—	—	16	14 7/16	—	—	
2	14	—	—	—	17	—	—	—	
3	—	13 7/16	—	—	18	—	—	—	
4	—	13½	—	—	19	14	—	—	
5	—	13 5/16	—	—	20	13 13/16	—	—	
6	—	13 5/16	—	—	21	13 7/16	—	—	
7	—	—	—	—	22	13 7/16	—	—	
8	—	—	—	—	23	13½	—	—	
9	—	—	—	—	24	—	—	—	
10	—	—	—	—	25	—	—	—	
11	—	—	—	—	26	13 5/16	—	—	
12	—	—	—	—	27	13 5/16	—	—	
13	—	—	—	—	28	13 7/16	—	—	
14	—	—	—	—	29	13 7/16	—	—	
15	14	—	—	—	30	13 5/16	—	—	
					31	—	—	—	

Note: No quotations have been made on the London Exchange since June 6.

Average Monthly Price Per Pound

Month	1938 Pence	1939 Pence	1940 Pence	1941 Pence	Month	1938 Pence	1939 Pence	1940 Pence	1941 Pence
Jan.	7.077	7.926	11.793	12.415	Aug.	7.841	8.545	12.818	
Feb.	7.029	7.942	12.577	12.769	Sept.	7.918	9.634	11.964	
Mar.	6.590	8.120	11.651	13.967	Oct.	8.355	10.177	11.813	
Apr.	5.793	7.910	10.980	14.228	Nov.	8.111	11.210	11.801	
May	5.632	8.002	11.600	13.670	Dec.	8.005	11.559	11.963	
June	6.147	8.216	13.046	—	Average for Year.	7.164	8.959	12.035	
July	7.464	8.271	12.410	—					

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market)

Recent Daily Price Per Pound

Date	1942 June	1942 July	1942 Aug.	Date	1942 June	1942 July	1942 Aug.	Date	1942 June	1942 July	1942 Aug.
1	20.35	20.36	19.48	11	19.41	20.82	19.32	22	19.96	20.19	
2	20.07	20.57	—	12	19.47	—	19.22	23	19.97	19.91	
3	19.95	20.71	19.51	13	19.60	20.71		24	19.86	19.94	
4	20.10	—	19.67	14	—	20.58		25	19.83	19.99	
5	19.93	—	19.56	15	19.41	20.71		26	19.81	—	
6	19.44	20.53	19.65	16	19.55	20.43		27	19.91	19.73	
7	—	20.77	19.59	17	19.84	20.14		28	—	19.72	
8	19.13	20.74	19.21	18	19.67	20.12		29	20.02	19.58	
9	19.56	20.86	—	19	19.70	—		30	20.30	19.47	
10	19.66	20.70	19.12	20	19.86	20.02		31	—	19.53	
				21	—	20.19					

Average Monthly Price Per Pound

	1939 Cents	1940 Cents	1941 Cents	1942 Cents		1939 Cents	1940 Cents	1941 Cents	1942 Cents
Jan.	8.94	11.19	10.66	19.85	Aug.	9.30	9.84	17.06	
Feb.	8.97	11.10	10.87	20.07	Sept.	9.30	9.69	17.94	
Mar.	9.00	10.90	11.08	20.42	Oct.	9.24	9.62	17.31	
Apr.	8.87	10.89	11.48	21.10	Nov.	9.73	9.97	17.21	
May	9.56	10.33	12.97	20.88	Dec.	1097	10.18	18.09	
June	9.88	10.72	14.66	19.78	Average for Year	9.46	10.40	14.66	
July	9.71	10.42	16.55	20.27					

Stocks of Crude Rubber

(All figures are in long tons)

ON HAND OR AFLOAT TO THE U. S.

End of	ON HAND 1939	1940	1941	AFLOAT 1939	1940	1941	TOTAL 1939	1940	1941
Jan.	220,727	139,304	309,411	48,210	90,283	153,169	268,937	229,589	462,580
Feb.	207,882	129,023	320,372	55,814	112,257	136,955	263,696	241,280	457,327
Mar.	201,752	134,871	338,147	55,981	113,619	140,228	257,733	248,490	478,375
Apr.	188,074	152,645	329,767	57,918	102,557	153,484	245,992	255,202	483,251
May	187,980	148,881	359,234	54,046	109,364	147,459	242,026	258,245	506,693
June	173,493	154,313	339,108	51,274	119,138	175,499	224,767	273,451	514,607
July	165,450	175,455	395,216	52,990	139,629	132,304	218,440	315,084	527,520
Aug.	152,029	194,760	446,008	66,717	141,286	90,591	218,746	336,046	536,599
Sept.	136,824	220,597	473,684	68,310	137,888	141,756	205,134	358,485	615,440
Oct.	119,404	235,353	454,711	100,500	166,837	172,633	219,904	402,190	627,344
Nov.	105,205	250,412		114,044	158,095		219,249	408,507	
Dec.	125,800	288,864		91,095	145,950		216,895	434,814	

Note: Above figures include stocks held by United States Government.

STOCKS OUTSIDE REGULATED AREAS

(Figures from the International Rubber Regulation Committee)

1940	Singapore and Penang	Para and Manaos	United Kingdom	United States	Total
November	33,778	3,697	30,000*	276,943	344,418
December	26,773	2,165	35,000*	318,486	382,424
1941					
January	37,145	2,151	40,000*	309,411	388,707
February	46,888	2,510	40,000*	320,372	409,795
March	41,005	1,200	40,000*	338,147	420,352
April	42,065	2,205	40,000*	329,767	414,057
May	44,593	1,768	40,000*	364,107	450,485
June	43,263	915	40,000*	339,108	423,286
July	41,534	1,063	40,000*	395,216	477,813
August	44,920	1,145	40,000*	446,008	532,073
September	32,997	1,772	40,000*	473,684	548,453
October	48,399	2,048	40,000*	454,711	545,158

* Estimated.

STOCKS INSIDE REGULATED AREAS

(Figures from the International Rubber Regulation Committee)

1940	Malaya	N.E.I.[1]	Ceylon [1]	Other *	Total
November	43,693	39,267	11,675	3,997	98,632
December	48,787	48,622	11,850	4,124	113,383
1941					
January	47,198	45,137	13,196	4,329	109,860
February	55,512	48,795	14,677	4,064	123,048
March	44,522	48,534	13,841	4,210	111,107
April	53,237	46,787	14,432	4,009	118,465
May	46,511	49,184	14,444	3,772	113,911
June	46,758	51,354	11,908	4,432	114,452
July	49,666	56,352	13,595	4,113	123,726
August	46,558	55,601	12,444	4,003	118,606
September	46,299	48,667	13,052	2,140	110,158
October	50,325	.....	14,366	3,961	.....

([1]) Estates and Dealers. (*) Estimated.

RUBBER STOCKS AFLOAT

End of: 1940	Afloat for United States	Afloat for Europe	All Other Afloat	Total Afloat
August	141,286	55,000	53,714	255,000
September	137,033	60,000	67,967	265,000
October	166,837	60,000	38,163	265,000
November	158,095	60,000	31,905	250,000
December	145,950	60,000	44,050	250,000
End of: 1941				
January	153,169	60,000	51,831	265,000
February	136,955	60,000	48,045	245,000
March	140,228	60,000	59,772	260,000
April	153,484	60,000	61,516	275,000
May	147,459	60,000	47,541	255,000
June	175,499	60,000	39,501	275,000
July	132,304	60,000	47,696	240,000
August	90,591	60,000	.....	.....

Note: *Total Afloat* figures are estimated at 1½ months' world shipments by the International Rubber Regulation Committee. *Afloat for U. S.* is supplied by the Rubber Manufacturers Association. *Afloat for Europe* is estimated. *All Other Afloat* is determined by subtraction.

TOTAL WORLD STOCKS

At End of:	1936	1937	1938	1939	1940	1941
January	600,479	454,249	549,762	497,665	433,841	753,021
February	599,355	445,265	565,833	479,578	429,551	769,193
March	583,318	447,856	586,666	460,723	447,472	783,737
April	567,172	428,249	586,291	438,252	465,345	765,521
May	541,871	413,134	568,158	429,979	470,981	777,429
June	520,255	434,250	573,136	407,640	500,774	771,241
July	519,074	445,782	580,654	418,639	547,708	780,324
August	500,520	457,462	565,394	397,345	579,119	839,019
September	493,585	470,768	551,447	396,867	631,888	874,917
October	486,159	479,398	540,976	413,274	651,775	905,138
November	466,491	493,266	512,196	395,217	659,308	.....
December	466,576	545,533	482,852	391,125	702,089	.....
Monthly Avge.	528,738	460,022	555,280	427,192	543,321	.....

Note: Figures prior to 1941 represent principal world stocks only, as supplied by the Department of Commerce. Figures since 1941 represent total world stocks, as compiled by the Commodity Exchange, Inc.

U. S. Tire and Tube Statistics

(All Figures Represent Thousands)

AUTOMOBILE CASINGS

Production Figures on Quarterly Basis

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	13,437	13,355	11,376	15,565	7,314	13,946	14,896	16,334
Apr.-June	13,565	12,597	14,892	15,834	7,380	13,759	15,636	18,308
July-Sept.	9,822	11,312	14,914	12,207	10,794	15,182	13,877	15,123
Oct.-Dec.	10,406	12,099	14,858	9,704	12,360	14,726	14,777	11,768
Total	47,230	49,363	56,040	53,310	37,848	57,613	59,186	61,533

Shipment Figures on Quarterly Basis

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	10,730	11,154	10,554	14,143	7,388	12,445	12,791	15,264
Apr.-June	14,998	13,473	15,940	15,741	9,564	15,107	17,595	21,276
July-Sept.	11,648	13,489	14,037	13,106	11,243	15,791	12,904	18,104
Oct.-Dec.	9,310	12,066	12,855	10,495	12,098	14,165	15,484	12,519
Total	46,686	50,182	53,386	53,485	40,293	57,508	58,774	66,163

Inventory Figures [2]

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	11,651	11,675	8,762	12,004	10,547	9,963	10,789	10,149
Apr.-June	10,219	10,755	7,556	12,081	8,337	8,632	8,871	7,088
July-Sept.	8,419	8,288	8,690	11,200	7,859	8,080	9,837	5,154
Oct.-Dec.	9,455	8,196	10,717	10,383	8,166	8,665	9,127	4,417

Figures for Recent Months

	PRODUCTION 1940	1941	1942	SHIPMENTS 1940	1941	1942	INVENTORY [2] 1940	1941	1942
Jan.	4,955	5,487	1,369	4,274	4,850	1,231	9,352	9,797	4,550
Feb.	4,916	5,162	1,113	4,144	4,896	1,116	10,137	10,029	4,553
Mar.	5,025	5,686	1,156	4,373	5,518	1,027	10,789	10,149	4,809

AUTOMOBILE INNER TUBES

Production Figures on Quarterly Basis

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	12,823	12,553	11,891	15,831	7,314	12,383	12,801	15,349
Apr.-June	13,191	11,631	14,624	15,413	7,380	11,847	13,703	17,584
July-Sept.	10,321	11,270	15,320	12,038	10,794	13,118	12,425	13,858
Oct.-Dec.	9,891	12,425	15,201	9,092	12,360	13,300	13,308	10,591
Total	46,226	47,879	57,036	52,374	37,848	50,648	52,237	57,382

Shipment Figures on Quarterly Basis

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	10,640	11,252	11,367	14,606	7,387	11,422	11,683	14,264
Apr.-June	14,553	11,928	15,113	15,495	9,564	13,010	14,978	18,576
July-Sept.	11,545	13,251	15,069	12,901	11,243	13,449	11,344	15,490
Oct.-Dec.	8,306	11,636	12,874	9,765	12,099	13,309	14,209	11,359
Total	45,044	48,067	54,423	52,767	40,293	51,190	52,214	59,689

Inventory Figures [2]

Quarter	1934	1935	1936	1937	1938	1939	1940	1941
Jan.-Mar.	10,244	10,406	8,660	11,993	10,547	8,752	8,110	8,069
Apr.-June	8,795	10,050	8,075	11,833	8,337	7,549	6,848	7,010
July-Sept.	7,639	7,565	8,595	11,326	7,859	7,206	7,970	5,431
Oct.-Dec.	9,180	8,231	10,945	10,312	8,166	7,306	7,017	4,678

Figures for Recent Months

	PRODUCTION 1940	1941	1942	SHIPMENTS 1940	1941	1942	INVENTORY [2] 1940	1941	1942
Jan.	4,199	5,112	1,328	3,761	4,473	1,257	7,417	7,633	4,712
Feb.	4,207	4,887	1,051	3,805	4,610	1,099	7,828	7,924	4,678
Mar.	4,395	5,349	1,129	4,117	5,182	986	8,110	8,069	5,026

[1] These figures are based on reports received from the Rubber Manufacturers Association. They are revised frequently and the latest available issue should be consulted for most reliable figures.

[2] Stocks held by manufacturers at end of period indicated.

Automobile Production

Year	United States Total	Passenger Cars	Trucks	Canada Total	Passenger Cars	Trucks	Grand Total
1930	3,355,986	2,814,452	540,534	154,192	125,442	28,750	3,510,178
1931	2,389,730	1,973,090	416,640	82,621	63,477	19,144	2,472,351
1932	1,370,678	1,135,493	235,187	60,816	50,718	10,098	1,431,494
1933	1,920,057	1,573,512	346,545	65,924	53,855	12,069	1,992,126
1934	2,753,111	2,177,919	575,192	116,852	92,647	24,205	2,869,963
1935	3,946,934	3,252,244	694,690	172,877	135,562	37,315	4,119,811
1936	4,454,115	3,669,528	784,587	162,159	128,369	33,790	4,616,274
1937	4,808,974	3,915,889	893,085	207,463	153,046	54,417	5,016,437
1938	2,489,085	2,000,985	488,100	166,086	123,761	42,325	2,655,171
1939*	3,577,292	2,866,796	710,496	155,426	108,369	47,057	3,732,718
1940	4,469,354	3,692,328	777,026	222,984	110,126	112,858	4,692,338
1941	4,838,561	3,744,300	1,094,261	270,431	94,045	176,386	5,108,992
1941							
July *	444,241	343,748	100,493	24,654	3,849	20,805	468,895
Aug.	147,600	78,529	69,071	17,192	3,160	14,032	164,792
Sept.	234,255	167,790	66,465	14,496	2,548	11,948	248,751
Oct.	382,000	295,568	86,432	19,360	5,635	13,725	401,360
Nov.	352,347	256,101	96,246	21,545	7,003	14,542	373,892
Dec.	282,205	174,962	107,243	20,313	6,651	13,662	302,518
1942							
Jan.	238,261	147,858	90,403	21,751	4,249	17,502	260,012
Feb.	134,134	52,200	81,834	20,181	3,989	16,192	154,315
Mar.	94,510	6,216	88,294	20,188	3,192	16,996	114,698

* Revised.

Note: U. S. figures represent factory sales; Canadian, production.

Exports of Crude Rubber from Principal Producing Countries

(Long Tons)

	BRITISH MALAYA							NETHERLAND INDIES						
	Gross Exports	Imports	Net Exports	Ceylon	India & Burma	Sarawak	British North Borneo	Thailand	Java & Madura	Sumatra E. Coast	Other N.I.	Indo-China	Amazon Valley	All Other	World Total
1923	252,016	70,432	181,584	39,971	6,416	5,705	4,237	1,718	32,930	46,344	57,822	5,067	16,763	7,856	406,413
1924	259,706	108,524	151,182	39,997	7,697	6,699	4,621	2,962	42,446	54,497	80,347	6,688	23,165	9,065	429,366
1925	316,825	158,022	158,803	49,566	10,082	5,424	5,377	5,377	46,757	65,499	120,626	7,881	25,298	13,797	514,487
1926	391,328	151,243	240,085	58,962	9,874	9,153	6,079	4,027	52,186	71,413	121,231	8,203	24,298	16,017	621,536
1927	371,322	182,845	188,477	55,356	11,321	10,923	6,582	5,472	55,297	77,815	142,171	8,645	28,782	15,633	606,474
1928	409,430	149,787	259,643	57,267	10,790	10,087	6,698	4,813	58,848	82,511	121,770	9,548	21,129	10,690	653,794
1929	574,836	163,092	411,744	81,584	11,663	11,077	7,381	5,018	65,990	87,789	134,037	9,696	21,148	6,767	853,894
1930	547,043	133,876	413,167	76,970	10,782	10,309	6,781	4,251	69,755	79,396	115,254	7,665	14,260	5,651	814,241
1931	519,740	125,506	394,234	61,769	8,470	10,451	6,247	4,218	75,952	87,747	116,009	11,696	12,121	3,292	792,203
1932	478,252	92,539	385,713	48,973	3,888	6,960	4,664	3,451	61,312	79,837	85,871	13,883	6,450	1,816	702,818
1933	573,412	167,377	406,035	63,351	4,527	10,874	7,555	7,765	73,851	91,861	149,659	18,394	9,883	2,737	846,312
1934	677,361	211,803	465,558	79,746	10,492	17,233	11,103	17,545	87,400	112,058	175,470	20,170	8,903	2,985	1,008,663
1935	590,319	174,652	415,667	84,316	13,968	19,465	8,885	28,327	57,488	78,325	139,297	28,816	11,273	8,745	864,574
1936	520,286	167,799	352,487	49,692	14,724	21,243	8,177	33,702	61,307	84,577	152,205	40,782	14,193	11,466	845,431
1937	681,638	213,446	468,192	70,353	17,015	25,922	13,213	5,551	84,085	139,632	207,863	43,399	15,576	13,063	1,133,864
1938	526,911	156,101	370,810	49,528	15,178	17,792	9,512	41,080	57,526	94,501	145,909	58,518	14,618	12,920	887,892
1939	553,324	177,851	375,473	61,026	15,881	24,014	11,864	41,266	72,786	117,791	181,272	65,140	13,892	22,224	1,002,629

	British Malaya [1]	N.E.I.	Ceylon [2]	India & Burma [2]	North Borneo	Sarawak	Thailand	Indo-China	Oceania	Africa [2]	Liberia	South America	Mexico (Guayule)	Grand Total
1940	540,417	536,740	88,894	23,317	17,623	35,166	43,940	64,437	2,267	10,103	7,223	17,601	4,106	1,391,834
1940:														
Sept.	58,892	44,009	9,985	1,319	1,743	2,404	3,247	9,303	100	800	323	1,295	200	133,715
Oct.	52,767	50,139	8,127	1,841	1,693	2,564	3,355	2,082	200	800	600	1,860	200	126,228
Nov.	36,045	37,387	5,623	2,626	1,130	3,360	3,463	6,715	200	800	600	1,500	200	99,649
Dec.	56,263	35,325	10,700	3,405	1,028	3,520	5,343	9,000	200	600	813	1,427	392	128,216
1941:														
Jan.	37,804	58,593	7,859	1,486	2,085	2,445	2,137	9,058	333	667	750	2,103	288	125,608
Feb.	27,115	42,091	4,332	1,421	1,686	2,922	4,137	1,995	96	854	828	1,814	414	89,705
Mar.	56,651	53,233	6,073	1,770	1,154	3,726	5,712	6,286	117	636	958	2,835	355	139,506
Apr.	40,590	48,915	6,985	1,661	2,175	3,118	4,271	....	263	864	756	2,009	423	112,024
May	53,062	48,099	7,638	1,831	1,237	3,849	1,841	6,225	156	800	180	1,080	334	126,332
June	51,247	48,496	8,925	1,056	986	3,195	2,831	7,318	200	800	919	1,510	250	127,733
July	53,373	53,429	7,387	939	1,803	3,799	3,614	3,445	200	800	750	1,253	250	131,042
Aug.	46,404	51,890	9,081	725	1,812	3,086	4,852	6,496	200	800	750	1,288	250	127,634
Sept.	70,598	65,496	6,706	145	1,371	2,495	6,524	8,000	200	800	750	1,421	250	164,756
Oct.	31,101	54,038	8,315	1,563	2,264	3,044	3,074	6,000	200	800	750	2,149	250	113,548

(1) Including Brunei and Labuan; figures shown represent rubber which has actually been shipped and include rubber from the free stocks in Singapore and Penang. (2) Exports of domestic produce. (3) Exclusive of Liberia. Notes: Figures shown prior to 1940 were furnished by the United States Department of Commerce. Figures since 1940 were furnished by the International Rubber Regulation Committee, which accounts for the difference in the principal producing countries shown. Many figures for current months are provisional only and are later revised when more definite statistics are available. Therefore, it is suggested that figures from the most recent issue should be taken as more reliable.

Net Imports of Crude Rubber into Principal Manufacturing Countries

(Long Tons)

	United States [1]	United Kingdom	France (h)	Germany	Canada (ac)	Japan (da)	Italy	Russia (ce)	Australia (cd)	Belgium (d)	Netherlands	Scandinavia (abcdf)	Spain (g)	Czechoslovakia (abcd)	Total
1919	238,407	42,671	17,685	5,584	6,395	9,753	9,894	75	1,002	3,995	2,771	3,149	2,418	9	343,808
1920	249,530	56,844	13,885	11,890	11,746	5,297	6,123	62	1,815	3,840	5,510	2,292	2,008	56*	371,409
1921	179,736	42,087	15,135	21,920	8,124	21,713	3,906	165	1,014	1,705	1,022	1,279	2,245	569	300,620
1922	296,594	11,724	24,352	27,546	9,207	15,934	6,430	2,493	2,643	172	—3,807	1,778	589	567	396,222
1923	301,527	12,700	27,392	18,519	13,277	15,372	8,489	2,986	1,649	2,184	792	2,528	630	1,128	409,173
1924	319,103	—11,550	30,446	22,727	14,299	19,571	8,764	2,346	3,124	2,688	—807	3,178	944	1,370	416,203
1925	385,596	4,061	32,956	33,937	19,683	11,117	11,412	7,088	4,757	2,930	875	3,149	1,155	1,558	520,274
1926	399,981	84,865	34,240	22,775	20,229	18,125	9,809	6,529	9,021	2,498	2,670	4,046	1,290	1,870	617,957
1927	403,472	60,249	34,271	38,892	26,405	20,521	11,381	12,018	9,490	6,482	636	4,224	2,055	2,672	632,768
1928	407,572	4,846	36,498	37,855	30,447	25,621	12,433	15,134	8,430	7,958	2,243	4,418	3,178	3,138	599,771
1929	528,608	122,675	55,093	49,275	35,453	34,284	17,169	11,774	15,886	9,445	3,022	6,440	864	4,650	894,638
1930	458,036	120,069	68,503	45,488	28,793	33,039	18,639	16,387	5,354	10,635	2,924	7,710	2,400	4,468	822,445
1931	475,993	86,170	46,466	39,688	25,261	43,483	10,149	30,671	7,649	11,009	2,220	6,360	2,605	7,717	794,641
1932	393,844	44,086	42,506	45,121	20,917	56,027	14,469	30,637	12,576	9,519	2,851	7,262	4,359	9,444	693,618
1933	398,365	73,335	61,953	54,120	19,332	66,831	19,341	29,830	13,534	11,166	1,243	7,831	5,520	10,402	772,803
1934	439,172	158,482	49,560	59,330	28,439	69,905	21,398	47,271	9,642	9,115	3,758	12,418	6,900	10,999	926,389
1935	455,758	128,829	51,450	62,899	26,870	57,567	21,880	37,572	9,978	7,593	4,068	11,878	8,140	11,245	895,727
1936	475,359	—2,591	57,032	71,794	27,871	61,223	16,534	30,967	14,109	9,648	2,888	11,236	6,668	8,772	791,510
1937	592,394	92,707	59,871	98,170	36,088	62,311	24,733	30,462	19,164	14,970	4,343	4,680	2,400	13,063	1,055,356
1938	406,343	133,079	59,660	90,200	25,696	45,836	28,170	25,650	11,944	11,309	5,092	16,034	2,400	9,936	871,349
1939	486,348				31,615	42,352			15,426	9,612	7,051				
1940	811,564														
1940:															
Feb.	41,797	7,500	5,000*	....	3,508	5,241	1,500*	2,000*	1,846	694	495	1,200*	200*	....	....
Mar.	58,302	14,200	5,000*	....	3,062	6,057	1,500*	2,000*	1,784	....	627	1,200*	200*	....	....
Apr.	70,135	16,400	5,000*	....	3,096	2,000*	1,500*	2,000*	1,612	....	....	1,200*	200*	....	....
May	50,610	10,000	5,000*	....	3,108	2,500*	1,500*	2,000*	2,128	....	....	1,200*	200*	....	....
June	53,266	9,500	5,000*	....	1,062	3,000*	1,500*	2,000*	1,181	....	....	1,200*	200*	....	....
July	69,496	19,500	5,000*	....	5,112	3,000*	1,500*	2,000*	1,902	....	....	1,200*	200*	....	....
Aug.	72,612	21,250	5,000*	....	4,605	4,500*	1,500*	2,000*	2,508	....	....	1,200*	200*	....	....
Sept.	78,306	25,940	5,000*	....	2,743	....	1,500*	2,000*	2,485	....	....	1,200*	200*	....	....
Oct.	74,400	.....	5,000*	....	8,336	....	1,500*	2,000*	590	....	....	1,200*	200*	....	....
Nov.	72,775	.....	5,000*	....	5,451	....	1,500*	2,000*	1,366	....	....	1,200*	200*	....	....
Dec.	97,794	.....	5,000*	....	7,437	....	1,500*	2,000*	721	....	....	1,200*	200*	....	....
1941:															
Jan.	86,541	.....	5,000*	....	6,290	....	1,500*	2,000*	1,065	....	....	1,200*	200*	....	....
Feb.	73,647	.....	5,000*	....	3,770	....	1,500*	2,000*	1,717	....	....	1,200*	200*	....	....
Mar.	86,794	.....	5,000*	....	3,879	....	1,500*	2,000*	3,486	....	....	1,200*	200*	....	....
Apr.	64,521	.....	5,000*	....	2,531	....	1,500*	2,000*	2,326	....	....	1,200*	200*	....	....
May	101,034	.....	5,000*	....	5,596	....	1,500*	2,000*	1,549	....	....	1,200*	200*	....	....
June	64,101	.....	5,000*	....	2,818	....	1,500*	2,000*	1,373	....	....	1,200*	200*	....	....
July	96,658	.....	5,000*	....	4,143	....	1,500*	2,000*	2,003	....	....	1,200*	200*	....	....
Aug.	105,556	.....	5,000*	....	10,683	....	1,500*	2,000*	1,251	....	....	1,200*	200*	....	....
Sept.	81,742	.....	5,000*	....	....	....	1,500*	2,000*	4,392	....	....	1,200*	200*	....	....

a—Including gutta percha. b—Including balata. c—Re-exports not deducted in monthly statistics. d—Including some scrap and reclaimed rubber. e—Official statistics of rubber imports by Soviet Russia. f—Including Norway, Sweden, Denmark and Finland. g—United Kingdom and French exports to Spain except in years prior to 1925. h—French imports have been reduced in order to eliminate imports of gutta percha and to reduce to basis of net weight. [1]—United States imports of guayule are included in this compilation. *—Figure is provisional; final figure will be shown when available.

NOTE: ANNUAL FIGURES ARE MORE ACCURATE; THEY ARE REVISED AT THE END OF THE FOLLOWING YEAR.

The WHERE-TO-BUY Section of THE RUBBER AGE in which are listed the Products and Services of the Leading Suppliers to the Industry.

The Market Place

If what you are seeking is not listed here, write to the Service Department of THE RUBBER AGE, 250 West 57th St., New York, N. Y.

Chemicals and Compounding Materials

ACCELERATOR Z 51
- Good Aging Properties
- Free from Rapid Overcure
- Safe Processing Properties
- Low Dosages for Optimum Cures

Advance Solvents & Chem. Corp.
245 Fifth Ave. New York, N. Y.

ACCELERATORS—
El-Sixty; Ureka; Ureka C; Guantal; Santocure; DPG; Pip Pip; A-10; A-32; A-46; A-100; R-2 Crystals • ANTIOXIDANTS—Flectol H, White; Santoflex B, BX; Santovar A.

MONSANTO CHEMICAL CO.
Rubber Service Dept.
1012 Second National Bldg., Akron, Ohio

AERO BRAND
RUBBER CHEMICALS
DPG—DOTG—Accelerator 49
Rubber Sulphur
American Cyanamid & Chemical Corporation
30 Rockefeller Plaza, New York, N. Y.

ALUMINUM FLAKE
A uniform, fine, low gravity, white reinforcing pigment. *Furnished to the rubber trade for 39 years.*

The Aluminum Flake Co.
Akron, Ohio

ALUMINUM HYDRATES
"Alorco" Hydrated Aluminas reinforcing pigments give many desirable properties to rubber. Send for sample.

ALUMINUM CO. OF AMERICA
1970 Gulf Bldg. Pittsburgh, Pa.

ANTIMONY Pentasulphide, golden and crimson, very fine, pure.

Rare Metal Products Co.
Belleville, N. J.
Direct Factory Representation

CALCENE—The Ideal low gravity, white reinforcing pigment. Gives high tensile and elongation properties with exceptionally good resistance to tear and abrasion.
PITTSBURGH PLATE GLASS CO.,
COLUMBIA CHEMICAL DIV.
30 Rockefeller Plaza, New York, N. Y.

CARBON BLACK— *Micronex* the world's standard gas black, universally known as the "King of Rubber Pigments."

Binney & Smith Co.
41 East 42nd St. New York City

CARBON BLACK
CONTINENTAL
The Newest Name in Carbon Black offers
CONTINENTAL DUSTLESS
CONTINENTAL COMPRESSED
CONTINENTAL UNCOMPRESSED
Continental Carbon Company
295 Madison Ave., New York, N.Y.

CARBON BLACK—Aerfloted
WYEX — TX — HX
Compressed — Compact (Dustless)
J. M. Huber, Inc.
460 West 34th St. New York

CARBON BLACK
"Atlantic" Carbon Blacks meet the exacting standards of modern rubber production.
Chas. Eneu Johnson & Co., Mfrs.
Distributed by
C. P. HALL CO.
Akron — Boston — Los Angeles — Chicago

CARBON BLACK
DIXIE...KOSMOS
Used throughout the world
UNITED CARBON COMPANY
Charleston, W. Va.
New York • Akron • Chicago

CARBON BLACK
WITCO DISPERSO
and DUSTLESS and a
Complete Line of High Quality
Rubber Chemicals
Wishnick-Tumpeer, Inc.
295 Madison Ave., New York, N.Y.

Do you believe in Your Products?
Then you should believe in telling the rubber industry about them. The MARKET PLACE is the logical place to display your wares.

CATALPO—The universal and standard rubber pigment now being used in treads, solids, tubes, carcass frictions, etc.

Moore & Munger
33 Rector Street New York City

CHEMICALS
Carbon Black—Clay—Colors
Accelerators—Sulphur
Stocks Carried At All Times
Ernest Jacoby & Co.
79 Milk St. Boston, Mass.
Cable Address: Jacobite Boston

CHEMICALS

For Rubber		For Industry Generally
Accelerators	*Acids*	*Latex*
Antioxidants	*Oil of Myrbane*	*Lotol*
Specialties	*Aniline Oil*	*Dispersions*

NAUGATUCK CHEMICAL
Division of United States Rubber Co.
1230 SIXTH AVE. NEW YORK

CHEMICALS
For Natural & Synthetic Rubber
"PICCO" Brand—Plasticizers; Coumarone Resins; Reclaiming Oils, Coal Tar Naphthas.
Pennsylvania Industrial Chem. Corp.
Clairton Penna.

CHEMICALS
A complete line of plasticizers, resins, substitutes, fillers, etc., for Synthetic, Natural and Reclaimed Rubber.
STANDARD CHEMICAL COMPANY
Akron Savings & Loan Bldg, Akron

CHEMICALS AND MINERAL
Ingredients—Whiting, Clay, Talc, Barytes, Colors. Heavy Calcined Magnesia. Carbonate of Magnesia, Pumice Stone.
Standard Since 1890
Whittaker, Clark & Daniels, Inc.
260 West Broadway New York

COAL TAR CHEMICALS

Coumarone Resins	Tack Producers
Resinous Oils	Dispersing Oils
Reclaiming Oils	Softeners
	Solvents

The Neville Company
Neville Island, Pittsburgh, Penna.

The Market Place

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Chemicals and Compounding Materials (continued)

COLLOIDAL SULPHUR
COLLOIDAL ZINC OXIDE
COLLOIDAL COLORS
HEVEATEX CORPORATION
78 Goodyear Ave. Melrose, Mass.
Offices in New York, Akron, Chicago

FACTICE—Prevents blooming, makes colors fast and a smoother batch.
Stamford Rubber Supply Co.
Stamford, Conn.

PARA-DORS—
overcome odors in rubber—effectively and at low cost.
GIVAUDAN-DELAWANNA, INC.
Industrial Aromatics Division
330 West 42nd St., New York, N. Y.

COLORS
BRILLIANT ORGANIC DYES; PERMANENT, NON-BLEEDING, LOW COST
For All Cures
MONSANTO CHEMICAL CO.
Rubber Service Dept.
1012 Second National Bldg., Akron, Ohio

FURNEX—FURNEX BEADS
—A cool mixing reinforcing black for Footwear and Mechanicals. Good ageing —Improved oil resistance.
Binney & Smith Co.
41 East 42nd St. New York City

PARA-FLUX
The Universal Softener—Adaptable, Uniform. Improves Quality—Economical.
The C. P. Hall Co.
2510 First Central Tower
Akron Ohio

COMPOUNDING Materials
Vulcanizing Agents
Accelerators
Antioxidants
Plasticizers
Dispersions
Pigments
Clays
Mineral Rubber
Aromatics
Blacks
R. T. VANDERBILT CO.
230 Park Ave. New York City

GASTEX
Special Process Reinforcing BLACK. Superior aging and oil resistant properties. Low permanent set.
GENERAL ATLAS CARBON DIV.,
GENERAL PROPERTIES CO., INC.
60 Wall St. New York

PELLETEX (The pellet *Gastex*)
The special process reinforcing black in free-flowing form. Saves power; none wasted; protects adjacent colored stocks.
GENERAL ATLAS CARBON DIV.,
GENERAL PROPERTIES CO., INC.
60 Wall St. New York

CUMAR —Paracoumarone Resin.
A neutral gum for rubber compounding.
Samples and prices on request.
The Barrett Div.
Allied Chemical & Dye Corp.
40 Rector St. New York City

IRON OXIDES
Asbestine—Barytes—Talc—Soapstone
C. K. Williams & Co.
EASTON, PA.

RUBBER PROCESSING OILS
For outstanding compatibility in processing natural or modern synthetic rubbers, use
SUN RUBBER PROCESSING OILS
Write
SUN OIL COMPANY
Philadelphia Pennsylvania

DU PONT Rubber Chemicals
DU PONT RUBBER COLORS
DU PONT ACCELERATORS
DU PONT ANTI-OXIDANTS
E. I. du Pont de Nemours & Co., Inc.
RUBBER CHEMICALS DIVISION
WILMINGTON, DELAWARE

MAGNESIUM OXIDE
Calcined Magnesium Oxide prepared for use in the compounding of neoprene. Full details on request.
J. T. Baker Chemical Co.
Phillipsburg New Jersey

RUBBER SUBSTITUTES
White, brown and black.
The Carter Bell Mfg. Co.
Springfield, New Jersey

EXTENDER
NAFTOLEN R 100 — Extender for Crude Rubber, Reclaim, Synthetics.
Wilmington Chemical Corporation
10 E. 40th St., New York, N. Y.

MAPICO COLORS
Pure Oxides of Iron
Yellows—Reds—Browns—Black
MAGNETIC PIGMENT CO.
Manufacturers
BINNEY & SMITH CO.
Distributors
41 East 42nd Street, New York, N. Y.

SOFTENERS
Rosin Oil — Pine Tar
Burgundy Pitch
"Galex" — a non-oxidizing Resin
National Rosin Oil & Size Co.
RKO Bldg. New York, N. Y.

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Use it—for RESULTS!

MOLD LUBRICANT
"Orvus" enables articles to leave molds readily; molds clean easily. Effective in hardest water. Also acts as thorough cleanser for molded and extruded rubber goods.
PROCTER & GAMBLE
Cincinnati Ohio

SOLVENTS
"Skellysolve"—A superior solvent in six different types for various uses—for making rubber cements—for many different rubber fabricating operations.
SKELLY OIL CO., SOLVENTS DIV.
Skelly Bldg., Kansas City, Mo.

The Market Place

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Chemicals and Compounding Materials (continued)

STEARIC ACID
STEAREX . . . CAKE or POWDER
STEAREX BEAD
Standardized Products for Rubber Compounding
MINERAL RUBBER (Parmr), TALC
SOAPSTONE
Binney & Smith Co.
41 East 42nd St. New York City

WAXES
Johnson's lustrous wax finishes retard oxidation, reduce friction, surface wear, tackiness.
S. C. JOHNSON & SON, INC.
Racine Wisc.

ZINC OXIDE PIGMENTS
The XX Reds Kadox
ZINC SULPHIDE PIGMENTS
The Cryptones The Albaliths (Lithopones)
The New Jersey Zinc Sales Co.
New York Chicago
Cleveland, Boston, San Francisco

SULPHURS
Rubbermakers' TIRE BRAND and TUBE BRAND. Also CRYSTEX Insoluble Sulphur, Sulphur Chloride, Caustic Soda, Carbon Bi-Sulphide, Carbon Tetra-Chloride.
Stauffer Chemical Company
2710 Graybar Bldg., New York City

ZINC OXIDES
AZO ZZZ Zinc Oxides
lead free—pure—uniform—dependable
AZO ZZZ-11 AZO ZZZ-55
AZO ZZZ-22 AZO ZZZ-44 AZO ZZZ-66
American Zinc Sales Company
Columbus, Ohio New York
Chicago St. Louis

ZINC OXIDES
Blank Label Red Label Green Label
Manufactured by Our New Electrothermic Process
St. Joseph Lead Co.
250 Park Ave., New York
Plant and Laboratory: Monaca (Josephtown), Pa.

TITANIUM PIGMENTS
TITANOX-A (Titanium Dioxide)
TITANOX-B (Titanium Barium Pigment)
TITANOX-C (Titanium Calsium Pigment)
TITANOX-L (Lead Titanate)
TITANIUM PIGMENT CORP.
SELLING AGENTS
111 Broadway, New York, N. Y.
104 S. Michigan Ave., Chicago, Ill.

The Progressive Concern Selling to Rubber Manufacturers Uses
THE MARKET PLACE
for Results

ZINC STEARATE
ZINC LAURATE
Colite Mold Lubricant for Extra High Gloss
THE BEACON COMPANY
87 Bickford St., Boston, Mass.

Machinery and Equipment

BANBURYS REPAIRED
Re-building and re-surfacing rotors and mixing chambers has been our specialty for years.
INTERSTATE WELDING SERVICE
914 Miami St. Akron, Ohio

DIAL GAUGES—Thickness
For measuring the thickness of rubber and similar materials. Many models.
Frank E. Randall
248 Ash St.,
Waltham Mass.

GRINDING MILLS
SPAN grinding mill reduces soft and hard rubber to fine powder.
Made in U. S. A.
M. Pancorbo
155 John St. New York, N. Y.

CALENDER SHELLS
Gammeter's
ALL STEEL Calender Shells.
All welded. Any size.
New and better.
The W. F. GAMMETER CO.
Cadiz Ohio

DRYING MACHINERY
For Synthetic Rubber, Reclaimed Rubber, Latex Processed Materials, etc.
PROCTOR & SCHWARTZ, INC.
Seventh St. & Tabor Rd. Philadelphia, Pa.

MACHINERY—RUBBER
"MASTER" Tube Molds, Tire Vulcanizers, Molds and Cores, Tire Drums, Tubers, etc.
Special Machinery Built to Order
Akron Standard Mold Co.
Akron, Ohio

CUTTING DIES
Cutting and perforating dies of all types for rubber manufacturers.
Send for our quotations
Brockton Cutting Die & Machine Co.
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EXTRUDERS
The pioneer line of tubers, strainers and wire insulating machines. For latest developments inquire of
JOHN ROYLE & SONS
Paterson New Jersey

MACHINERY
L. ALBERT & SON
Trenton, N. J. Stoughton, Mass.
Los Angeles, Calif. Akron, O.

CUTTING MACHINERY
Specialists in Rubber Cutting Equipment for Bands, Crude Stock, Jar Rings, Tubes, Rollers, Washers, Treads, Cement Stock, etc.
See Black Rock for All Cutting Problems
Black Rock Manufacturing Co.
179 Osborne St. Bridgeport, Conn.

FORMS - PORCELAIN
Exclusive Manufacturers of
Vitreous Porcelain Closed End Forms
No matter what shape or design—we can make it. Send blue print or sketch for our prices.
The Colonial Insulator Co.
936 Grant St. Akron, Ohio

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A complete service from the design of machinery to finished products of all kinds. Equipment for Plantations — also Reclaim, Latex and Rubber Plants.
Layouts — Formulas — Processes
Continental Machinery Company
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Machinery and Equipment {continued}

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Cutting, Trimming, Skiving, Cementing, Eyeletting, Cutting Dies—Eyelets.
United Shoe Machinery Corp.
140 Federal St., Boston, Mass.

MOLDS
For tires, rubber specialties and mechanical goods; general machine work.
The Akron Equipment Co.
Akron, Ohio

STOCK SHELLS
A Type for Every Need—Large Diameter—Light Weight — Extra Strong — Seamless.
National Sherardizing & Machine Co.
Hartford, Conn. Akron, Ohio

MAGNETIC EQUIPMENT of All Kinds
Separators, Clutches, Rolls; Drums, Brakes, Special Magnets
Stearns Magnetic Mfg. Co.
640 So. 28th St., Milwaukee, Wis.

Processing Equipment For Reclaiming Rubber
Attrition Mills; Conveyors; Crushers; Cutters; Elevators; "Frigidisc" Grinders; Hammer Mills; Mixers, Sifters, etc.
ROBINSON MFG. CO.
30 Church St., New York, N. Y.

TESTING MACHINES
RUBBER TENSILE TEST MACHINES
TEXTILE TESTING MACHINES
Write for Descriptive Literature
Henry L. Scott Co.
P. O. Box 963 Providence, R. I.

MANDRELS—All Types
Circular and Straight—Aluminum and Steel Licensed Under Clyde E. Lowe Co. Patents Sherardizing and Chrome Plating Machinery—Air Bag & Mandrel Polishing
National Sherardizing & Machine Co.
Hartford, Conn. Akron, Ohio

SPECIAL MACHINERY
For Quality and Efficiency in Working Rubber. Consult us about your problems.
Utility Manufacturing Co.
Cudahy, Wisconsin

WEATHERING UNIT
The National X-1-A Accelerated Weathering Unit quietly evaluates substitute materials, new formulas, established products.
NATIONAL CARBON CO., INC.
Carbon Sales Div.
Cleveland, Ohio

Rubber—Crude; Scrap; Latex; Dispersions

GUAYULE RUBBER
"AMPAR" BRAND
Washed and Dried
Continental Rubber Co. of N. Y.
745 Fifth Avenue New York

CRUDE RUBBER
SCRAP RUBBER
HARD RUBBER DUST
BALATA — GUTTA PERCHA
Hermann Weber Company
67 Broad St., New York

LATEX
Normal, Concentrated, Processed
HEVEATEX CORPORATION
78 Goodyear Ave., Melrose, Mass.
Offices in New York, Akron, Chicago

CREPE RUBBER
Specialists in Latex Crepe
Charles F. Connor & Co., Inc.
110 State St., Boston, Mass.
Telephone: LAFayette 3690

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Our long experience ideally equips us for the prompt, efficient handling of Manufacturers' Crude Rubber Purchase Permits.
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LOTOL
(Compounded Latex)
Ready to use
NAUGATUCK CHEMICAL
Division of United States Rubber Co.
Rockefeller Center, New York, N. Y.
Offices in Detroit, Boston, Indianapolis

CRUDE RUBBER
LATEX, BALATA
GUTTA-PERCHA, GUTTA-SIAK
Robert Badenhop Corporation
Woolworth Bldg., New York City

DISPERSITE
Water Dispersed Rubber
(Reclaimed—Crude—Synthetics)
Man-made Alternate for Latex
Dispersions Process, Inc.
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Offices in Detroit, Boston, Indianapolis

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Highly Concentrated (About 75%)
Rubber Latex
Sole Distributor for U. S. A. and Canada
Revertex Corp. of America
37-08 Northern Blv'd., L. I. City, N. Y.

CRUDE RUBBER
SCRAP RUBBER
Also HARD RUBBER DUST
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BRANCHES: Akron, Chicago, Boston Detroit, Los Angeles, London, Paris

YOUR PRODUCTS
Should be displayed in
THE MARKET PLACE
Show What You Have to Sell

RUBBER
Crude Rubber
Liquid Latex
Ernest Jacoby & Co.
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Cable Address: Jacobite Boston

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Rubber [Cont'd]

RUBBER—
Scrap and Crude
Also HARD RUBBER DUST
A. Schulman, Inc.
Darrow Road, Akron, Ohio
1401 Mississippi Ave., E. St. Louis, Ill.
736 Statler Bldg., Boston, Mass.
Warehouses at Akron and E. St. Louis

VULTEX— THE ONLY VULCANIZED LATEX
Insures Highest Quality, Uniformity, Economy, Simplicity of Application.
FULLY PROTECTED BY PATENTS
Also Latex and Latex Compounds
General Latex & Chemical Corp.
Successors to the Vultex Chemical Company
666 Main St. Cambridge, Mass.

The Progressive Concern Selling to Rubber Manufacturers Uses THE MARKET PLACE for Results

Reclaimed Rubber . . . .

NERVASTRAL RECLAIMING PROCESSES
HIGH GRADE — HIGH SPEED
HIGH ECONOMY
Rubber & Plastics Compounds Co., Inc.
30 Rockefeller Plaza, New York, N. Y.
Tel: COlumbus 5-0085

RECLAIMED RUBBER—
For All Purposes
NAUGATUCK CHEMICAL
Division of United States Rubber Co.
1230 Sixth Ave., N. Y. City

RECLAIMED RUBBER—
Uniformity, reliability, cleanliness
PEQUANOC RUBBER CO.
Butler, N. J.

RECLAIMED RUBBER—
A standardized grade for every requirement.
U. S. Rubber Reclaiming Co., Inc.
500 Fifth Ave., New York, N. Y.
"59 Years Serving the Industry Solely as Reclaimers"

Rubber—Synthetic

HYCAR
For extreme resistance to heat, abrasion, oil, gasoline, aging, and deterioration.
HYCAR CHEMICAL COMPANY
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Akron Ohio

NEOPRENE
In different types to meet stringent requirements.
The Neoprene Notebook carries up-to-date information on neoprene. Ask for it.
E. I. du Pont de Nemours & Co., Inc.
Rubber Chemicals Div.
Wilmington Del.

PERBUNAN
Oil Resistance—Heat Resistance
Long Life
Full information upon request.
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THIOKOL
Synthetic rubber available in several types, including powder form. Excellent heat and solvent resistance.
THIOKOL CORPORATION
Trenton N. J.

YOUR PRODUCTS
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THE MARKET PLACE
Show What You Have to Sell

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VINCULUX
Metal Conditioner; Rust Inhibitor; Bonding "Catalyst"
Saves Money—Eliminates Sandblasting and Pickling! Stops Corrosion! Improves Bonding!
Gallon, $5; Money back if not pleased.
PROTECTIVE COATINGS, INC.
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VULCANIZER PAINT
Protect your vulcanizer interiors with "Bonnejohn" paint—resists acids, abrasion, heat, oxidation.
Belke Manufacturing Co.
947 N. Cicero Ave., Chicago, Ill.

Fabrics—Liners, Holland

CUSTOM FINISHERS of
RUBBER REPELLENT LINERS
Capitol Process Liner Treatment
—
Textile Proofers, Inc.
One Gates Ave. Jersey City, N. J.

LINERS TREATED
Advantages of Porotex Treatment
1. All Compounds stripped easily. 2. Wrinkles never cause liners to crack. 3. Prevents rot; liners rendered heat and oil-proof. 4. Liners remain porous, reducing tendency to trap air.
POROTEX PRODUCTS
875 East 140th St. Cleveland, Ohio

PROCESSED LINERS
"CLIMCO"—Fabrics treated to prevent adhesion of rubber stocks.
"LINERETTE"—Treated paper for separating or interleaving light weight rubber stocks.
The Cleveland Liner & Mfg. Co.
5508 Maurice Ave., Cleveland, Ohio

Consultants

CONSULTING
LATEX TECHNOLOGIST
—
R. J. Noble, Ph.D.
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CONSULTING
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FOR SALE: 1—Southwark 1000 Ton Hydraulic Press, 24" dia. ram, complete with horizontal Hydraulic Pump and motor; 1—W. S. Hydro-Pneumatic Accumulator, 2500 PSI, 8 gal., with IR m.d. compressor; 1—Rotary Cutter, ball bearings, similar to #2 Ball & Jewell; 2—24" x 24" Hydraulic Presses, ram 12" dia.; 1—W. S. 15" x 18" Hydraulic Press, 9" dia. ram, 4" posts; 6—Semi-Automatic Hydraulic Presses; 1—Farrel Birmingham 16" x 36" Rubber Mill; Adamson 6" Tuber; 7—W. & P. Mixers; Dry Mixers, Pulverizers, Grinders, Tubers, Hydraulic Pumps, Calenders, etc. CONSOLIDATED PRODUCTS CO., INC., 14-19 Park Row, New York, N. Y.

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Dixie Clay	8,972	Sodium Oxalate	384
Essotex	4,300	Butyl Stearate	3,454
Locust Bean Gum (A Grade)	1,780	Gelatine (Indegel F)	1,470
Aroclor #1254	468	Keystone Whiting	149,575
Cork—through 18 mesh, on 30 mesh	1,384	Karaya Gum	2,426
Cumar VI-1½	287	Sussex Whiting #100	48,860
Laurex	1,279	Veroc Whiting	21,900
Leather Odorant (V-6031-5)	25	Pumice—8 plus 30	40,115
Morpholine	450	Pumice Stone WCD #2	1,228
Naphthenic Acid	198	Pumice Stone G50RT	1,181
Nuva Rosin	2,383	Accelerator #122	230
Sodium Fluoride	342	Cumar RH	1,696
		Cumar AX	422

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